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IS 2675 (1983): Enclosed distribution fuseboards and cutouts for voltages not exceeding 1000 V Ac and 1200 V Dc [ETD 7: Low Voltage Switchgear and Controlgear]



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Indian Standard

SPECIFICATION FOR
ENCLOSED DISTRIBUTION FUSEBOARDS
AND CUTOUTS FOR VOLTAGES NOT
EXCEEDING 1 000 V AC AND 1 200 V DC

(*Second Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR ENCLOSED DISTRIBUTION FUSEBOARDS AND CUTOUTS FOR VOLTAGES NOT EXCEEDING 1 000 V AC AND 1 200 V DC

(*Second Revision*)

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Indian Standard

SPECIFICATION FOR ENCLOSED DISTRIBUTION FUSEBOARDS AND CUTOUTS FOR VOLTAGES NOT EXCEEDING 1000 V AC AND 1200 V DC

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 27 September 1983, after the draft finalized by the Low Voltage Switchgear and Controlgear Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Distribution fuseboards find use in electricity distribution systems and in large buildings wherever there is a necessity to have a number of outgoing feeders to be supplied from common incoming feeder or feeders. This standard is intended to unify the requirements of such fuseboards.

0.3 This standard was originally brought out in 1960 and subsequently revised in 1966. This standard is being revised again to update the contents as well as to introduce new concept of diversity factor for distribution fuseboards. This revision takes into cognizance the distribution fuseboard as a form of factory built assembly, the requirements for which are elaborately covered in IS : 8623 (Part 1)-1976*.

0.4 This standard is intended to cover fuseboards for use in single phase and three phase ac systems and dc systems. This standard also covers cut-outs which could be considered as distribution fuseboards having a single circuit single-pole unit with an enclosure capable of being sealed.

0.5 Isolators and switches, normally associated with distribution boards as well as miniature circuit-breakers do not form parts of the distribution fuseboard. These are therefore not covered by this standard.

0.6 Fuseboards covered by this standard are intended to incorporate rewirable type, HRC or diazed type of fuses, having a current rating not exceeding 100 A.

NOTE — Rewirable type fuses of rated currents higher than 100 A are not considered standard (*see* IS : 2086-1963†).

*Factory-built assemblies of switchgear and controlgear for voltages up to and including 1 000 V ac and 1 200 V dc ; Part 1 General requirements.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers enclosed distribution fuseboards for voltages not exceeding 1 000 V ac and 1 200 V dc, the current rating in each outgoing circuit (fuse-way) not exceeding 100 A.

1.2 This standard applies only to distribution fuseboards incorporating the types of fuses specified in 6.5. It does not cover other equipment, such as switches, miniature circuit-breakers and instruments.

1.3 This standard also does not cover distribution pillars for which the provision of IS : 5039-1983† shall apply.

2. TERMINOLOGY

2.0 For the purposes of this standard, the definitions below, in addition to those given in IS : 1885 (Part XVII) -1979‡ and IS : 8623 (Part I) -1977§ shall apply.

2.1 **Enclosed Distribution Fuseboard** — An enclosure containing busbars, with fuses, for the purpose of protecting, controlling or connecting more than one outgoing circuit, fed from one or more incoming circuits.

2.2 **Pole of a Distribution Fuseboard** — When a busbar of a distribution fuseboard has associated with it fuses for outgoing circuits, the busbar, with its associated fuses, is called a pole of the distribution circuits.

2.3 **Neutral of a Distribution Fuseboard** — A busbar provided with terminals (and if required, links) for connection to the neutral conductor of outgoing and incoming circuits of a distribution system.

*Rules for rounding off numerical values (revised).

†Distribution pillars for voltages not exceeding 1 000 V ac and 1 200 V dc (first revision).

‡Electrotechnical vocabulary : Part XVII Switchgear and controlgear.

§Factory built assemblies of switchgear and controlgear for voltages up to and including 1 000 V ac and 1 200 V dc : Part I General requirements.

2.4 Conducting Part — A part which is capable of conducting current although it may not necessarily be used for carrying service current.

2.5 Clearance — The distance between two conductive parts along a string stretched the shortest way between these conducting parts.

2.6 Creepage Distance — The shortest distance between two conducting parts along the surface of the insulating material or along the joint of two insulating bodies.

2.7 Cutout — An appliance for automatically interrupting the transmission of energy through any conductor when the current rises above a pre-determined value, and shall also include fusible cut out.

2.8 Fuse-way — A part of the distribution fuseboard containing one or more fuse-holders connected to one or more circuits.

NOTE 1 — The neutral may or may not form part of the fuse-way.

NOTE 2 — The term 'Circuit' refers to each single load.

3. SERVICE CONDITIONS

3.1 Unless otherwise stated, the distribution fuseboards shall be suitable for use under the following conditions:

a) The reference ambient temperature of 40°C;

NOTE — This takes into account, the following:

- 1) Maximum ambient air temperature 45°C,
- 2) Maximum daily average ambient air temperature 35°C, and
- 3) Maximum yearly average ambient air temperature 30°C,

b) Altitude up to 1 000 m above sea-level;

c) Atmospheric climate not conducive to the growth of fungi and condensation of moisture; and

d) Atmosphere, not heavily polluted.

3.1.1 Where the service conditions differ appreciably from those stated above, the manufacture should state the appropriate derating factor applicable to the equipment.

3.2 Special service conditions may also exist as given in **5.2** of IS : 8623 (Part I)-1977*. Where such special service conditions exist, the applicable particular requirements shall be complied with or special agreement shall be made between the user and the manufacturer.

4. CLASSIFICATION OF FUSEBOARDS

4.1 Distribution fuseboards shall be of the types given below:

- a) Single-pole (SP) or cutout,
- b) Single-pole and neutral (SPN),
- c) Double-pole (DP),
- d) Triple-pole (TP), and
- e) Triple-pole and neutral (TPN).

4.2 The preferred number of fuse ways for single-pole and neutral, double-pole, triple-pole and neutral distribution fuseboard shall be 4, 6, 8, 10 and 12.

5. ELECTRICAL CHARACTERISTICS OF FUSEBOARDS

5.1 Rated Voltage — The preferred rated voltages of fuseboards shall be as follows:

ac single-phase	= 240 V
ac three-phase	= 415 V
dc 2 wire system	= 220 V
dc 3 wire system	= 440 V

5.2 Rated Current

5.2.1 Rating of Fuse-ways — The preferred values of rated current of the fuse ways shall be as follows:

6, 16, 25, 32, 63 and 100 A.

NOTE 1 — These ratings correspond to those of fuseboards.

NOTE 2 — All the fuse-ways in the distribution board should have the same current rating. However, combination of current ratings for different fuse-ways may be provided, if agreed between the supplier and the purchaser.

*Factory built assemblies of switchgear and controlgear for voltages up to and including 1 000 V ac and 1 200 V dc : Part 1 General requirements,

5.2.2 Rating of Busbars — Unless otherwise specified, the rating of the phase busbars shall take into account the diversity factor given in 5.4. The neutral busbar shall have the same rating as the main busbar for the single-pole, single-pole and neutral, and double-pole fuseboards. For triple-pole and neutral fuseboards the neutral busbar shall be of the same rating as the main busbars for fuseboards up to 32 A and of half the rating for the other sizes.

NOTE 1 — The rated currents specified above shall be carried satisfactorily to comply with the temperature-rise test specified in 8.2.

NOTE 2 — In the case of busbars having a central feeding point, it is permissible to have a phase busbar rating which is 50 percent of the normal rating computed on the basis of 5.2.2.

5.3 Rated Frequency — The rated frequency of the fuseboards in the case of ac shall be 50 Hz.

5.4 Rated Diversity Factor — The rated diversity factor of a fuseboard having several fuse-ways is the ratio of the maximum sum, at any one time, of the assumed currents of all the fuse-ways involved to the sum of the rated currents of all the fuse-ways of the fuseboard.

NOTE—When the manufacturer states a rated diversity factor, this factor shall be used for the purposes of temperature-rise test. In the absence of information, conventional values specified in Table 1 may be used.

TABLE 1 CONVENTIONAL VALUES OF DIVERSITY FACTOR

NUMBER OF FUSE WAYS	DIVERSITY FACTOR
2 and 3	0.9
4 and 5	0.8
6 to 9 inclusive	0.7
10 and above	0.6

6. DESIGN AND CONSTRUCTION

6.1 Mechanical Design

6.1.1 General — The fuseboards shall be constructed 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 service. The bus-bars and the fuse-ways shall be so arranged to facilitate their operating and maintenance, at the same time ensuring the desired degree of safety.

6.1.2 Clearances and Creepage Distances — The clearances, creepage distances and isolating distances shall conform to the provisions laid down in 6.1.2 of IS : 8623 (Part I)-1977* General guidance can be obtained from IS : 4237-1982†.

6.1.3 Terminals

6.1.3.1 The terminals shall be of substantial mechanical construction providing adequate electrical contact for appropriate size of cable used. The use of aluminium conductors should be taken into account and terminals should be capable of receiving the appropriate size of aluminium conductors.

6.1.3.2 Terminals connections shall be such that the conductors may be connected by screws or other equivalent means to maintain the necessary contact pressure permanently.

6.1.3.3 Terminal shall not turn or be displaced when the connecting screws are tightened and that the conductor may not become displaced.

6.1.3.4 Terminals shall be so mounted that the appropriate wire or cable may be connected without impairing the normal performance of the unit.

6.1.3.5 No contact pressure shall be transmitted through insulating material and the gripping of the conductor shall take place between metal faces.

6.1.3.6 If conductors are secured by means of pinching screws, the ends of the pinching screws shall be so shaped as to minimize damage to the conductor.

6.1.3.7 Wherever it is necessary, the cables may be connected to the terminals on the fuse bases.

6.1.3.8 Unless otherwise agreed between the manufacturer and user, on TPN fuseboards, terminals for the neutral conductor shall allow, the connection of aluminium conductors having a current carrying capacity:

- a) Equal to half the current carrying capacity of the phase conductor with 2 minimum of 25 mm², if the size of the phase conductor exceeds 25 mm²; and
- b) Equal to the full current carrying capacity of the phase conductor if the size of the latter is less than or equal to 25 mm.

NOTE — For certain applications, in which the current in the neutral may reach high values (for example, large fluorescent lighting installations) a neutral conductor having the same capacity as the phase conductor may be necessary.

*Factory built assemblies of switchgear and controlgear for voltages up to and including 1 000 V ac and 1 200 V dc : Part I General requirements.

†General requirements for switchgear and controlgear for voltages not exceeding 1 000 volts.

6.1.4 Busbars

6.1.4.1 Neutral busbars when provided shall be rigidly mounted in an accessible position, having one outgoing terminal for each three-phase circuit. The neutral busbars of 32 A rating and lower and three-phase and neutral fuseboards shall have provision for outgoing connection for each fuse.

6.1.4.2 Marking and arrangement for busbars shall be in accordance with IS : 375-1963*.

6.2 Enclosures and Degree of Protection

6.2.1 The types of enclosure shall be declared by the manufacturer and shall be in accordance with IS : 2147-1962†.

6.2.2 The enclosures shall be so arranged that on opening, the terminals are readily accessible and sufficient space shall be left in the interior or the enclosures for the accommodation of external conductors from their point of entry into the enclosures up to the terminals.

6.2.3 The movable parts of the protective enclosures shall be firmly secured to the fixed parts by a device to avoid accidental loosening or detaching due to the effects of operation of the equipment.

6.2.4 The covers of enclosures shall be so secured that it is not possible to open them without the use of tools; this provision need not apply in the following cases:

- a) When all the live parts are protected against accidental contact after the cover is opened,
- b) When only authorized persons have access to the distribution fuseboards, and
- c) Where there is a provision for sealing the enclosure.

6.2.5 Metallic Enclosures — Metallic enclosures shall be so arranged as to prevent any accidental contact between these enclosures and live parts when the enclosure is in place. If, for this purpose, the enclosures are partly or completely lined with insulating material, the lining shall be securely fixed to the enclosures.

6.2.6 Enclosures of Moulded or Other Insulating Materials — The material used shall comply with the following requirements.

*Marking and arrangement for switchgear busbars, main connections and auxiliary wiring (*revised*).

†Degrees of protection provided by enclosures for low-voltage switchgear and controlgear.

6.2.6.1 It shall be non-flammable at 250°C when tested in accordance with the flammability test given in IS : 2086-1982*.

6.2.6.2 It shall not soften when heated to a temperature of 85°C and tested in accordance with the plastic yield test given in 18 of IS : 867-1963†.

6.2.7 Enclosures of Hardwood — These shall be of hardwood (see IS : 399-1963‡). The material shall be non-flammable at 250°C when tested in accordance with the flammability tests given in IS : 2086-1982*.

Glue used in the construction of enclosures made of hardwood shall be insoluble in water.

The thickness of hardwood enclosures shall comply with Table 2.

TABLE 2 MINIMUM FINISHED THICKNESS OF HARDWOOD FOR ENCLOSURES FOR DISTRIBUTION FUSEBOARDS

SIZE OF ENCLOSURES, ANY OVERALL DIMENSION LYING BETWEEN	MINIMUM FINISHED THICKNESS OF WOOD				
	Cut Open Enclosures			Frame Door Enclosures	
	Sides	Front and Back		Sides	Door Frame Door Panel
(1) mm	(2) mm	(3) mm	(4) mm	(5) mm	(6) mm
Up to and including 203	8	5	15	16	6
Over 203 and up to 305	8	5	15	15	6
Over 305 and up to 380	8	6	15	20	6
Over 380	10	6	16	20	6

6.3 Earthing

6.3.1 The chassis, framework and the fixed parts of the metal casing of the fuseboard, where used, shall be provided with two separate earthing terminals (one in the case of cutouts). These terminals shall be provided over and above all other means provided for securing metallic enclosures (armour or other metallic coverings of current carrying cables).

*Carriers and bases used in rewirable type electric fuses up to 650 volts (*second revision*).

†Method of test for phenolic moulding materials (*revised*).

‡Classification of commercial timbers and their zonal distribution (*revised*).

3.2 The earthing terminals shall be readily accessible and so placed that the earth connection of the fuseboard is maintained even when the cover or any other movable part is removed.

6.3.3 The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. Under no circumstances shall a movable metal part of the enclosure be insulated from the part carrying the earthing terminal when the movable part is in place.

6.3.4 The earthing terminal shall be identified by means of the sign **+** marked in a legible and indelible manner on or adjacent to the terminals.

6.4 Protective Measures with Regard to Electric Shock

6.4.1 The design of the distribution fuseboard shall ensure that there is no possibility of the operator experiencing a shock during normal operation. It should be possible for the operator to renew any operated fuse-link in complete safety. Insulated barriers shall be provided wherever necessary so as to ensure that no accidental contact with any live parts inside the distribution fuseboard is possible.

6.5 Fuses Installed in the Fuseboard

6.5.1 Fuses installed in the fuseboard shall comply in all respects with IS : 2086-1982*, IS : 9224 (Part 1)-1979† and IS : 8187-1976‡ as the case may be.

6.6 Identification

6.6.1 Suitable provisions shall be made in the fuseboards to identify the different fuse-ways in respect of the circuits they serve. The phase and neutral conductors shall also be easily identifiable in accordance with IS : 375-1963§ (*see also 7.1.1.*).

7. MARKING

7.1 The following information shall be clearly and indelibly marked on all distribution fuseboards or on a label permanently attached to it:

- a) A reference to this standard, that is, Ref IS : 2675;
- b) Manufacturer's name or trade-mark;
- c) Country of manufacture;
- d) Rated voltage;

*Carriers and bases used in rewirable type electric fuses for voltages up to 650 volts.

†Low voltage fuses: Part 1 General requirements.

‡D-type fuses.

§Marking and arrangement for switchgear busbars, main connections and auxiliary wiring (*revised*).

- e) Total number of outgoing fuse ways;
- f) Rated current of outgoing fuse ways;
- g) Whether for use with ac, dc or both;
- h) Number of poles;

NOTE — It is desirable to indicate the number of poles and the neutral whether outgoing or incoming by means of a code (*see* 4.1), for example TPN for 'triple-pole and neutral'.

- j) Short-current strength; and
- k) Degree of protection.

7.1.1 Means, such as a label, shall be provided for marking every distribution fuseboard with appropriate space for recording the position in the distribution fuseboard; the name and the actual current rating of each outgoing circuits and in addition the current rating of cartridge fuses, when used; and the size and materials of the wire forming the fuse element in rewirable fuses when used. The position, of the poles shall be indicated by colouring or other means. This may be incorporated in the way-label. If a label is used, it shall be capable of being permanently and securely fixed, preferably inside the case; and if it is inside the case, the label may be a printed paper label. Where a numbering label is not mounted below the relevant fuse way, the circuit numbering shall indicate by symbol or diagram or both the relation to the fuse ways.

7.1.2 The distribution fuseboards may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8. TESTS

8.1 Tests shall be classified as given below:

8.1.1 *Type Test* — The following shall constitute type tests:

- a) Verification of temperature-rise limits (*see* 8.2),
- b) Verification of dielectric properties (*see* 8.3),
- c) Verification of short-circuit strength (*see* 8.4),
- d) Verification of clearance and creepage distances (*see* 8.5), and
- e) Verification of degree of protection (*see* 8.6).

8.1.2 Routine Test — The test for verification of dielectric properties (see 8.3) shall be carried out as routine test.

8.2 Verification of Temperature-Rise Limits

8.2.1 The provisions of 8.2.1 of IS : 8623 (Part 1)-1977* shall apply.

8.2.2 The final temperature attained by the fuses and the cable terminals shall not exceed the values given in the relevant specifications.

8.2.3 For this test, each fuse-way shall be loaded with rated current multiplied by the values of diversity factor given in 5.4.

8.3 Verification of Dielectric Properties

8.3.1 The provisions of 8.2.2 of IS : 8623 (Part 1)-1977* shall apply.

8.3.2 Test shall be made with the fuseboard in clean new condition or after having been exposed to the ordinary atmosphere with the doors of the fuseboard open for at least 24 hours.

8.3.3 The test voltage shall be at a frequency of 40 to 60 c/s. The value of test voltage shall be as given below:

<i>Rated Voltage (V)</i>	<i>Test Voltage V (rms)</i>
Up to and including 300	2 000
301 to 660	2 500
661 to 800	3 000
801 to 1 000	3 500

The voltage shall be applied and maintained for one minute:

- Between pairs of poles,
- Between poles and neutral (when fitted), and
- Between current-carrying and no current-carrying metal parts.

It is not necessary for the full test voltage to be switched on instantly, but the voltage shall be increased as rapidly as is constant with its value being indicated by the measuring instrument. The test voltage may be rapidly diminished before switching off.

8.3.4 During the test, one pole of the test transformer shall be connected to earth, and to the earthed metal of the distribution fuseboard.

8.3.5 For the purposes of routine test, the 24 h exposure is not necessary. It shall also be sufficient to apply the test voltage for a period of 1 second for routine test purposes.

*Factory-built assemblies of switchgear and controlgear for voltages up to and including 1 000 V ac and 1 200 V dc : Part 1 General requirements.

8.4 Verification of Short-Circuit Strength

8.4.1 Unless otherwise specified the short-circuit strength of distribution fuseboards shall not be less than that of the maximum rated fuse-link therein. The test for verification of short-circuit strength shall be subject to agreement between the supplier and purchaser.

8.5 Verification of Clearance and Creepage Distances — It shall be verified that the clearance and creepage distances comply with the provisions of 6.1.2.

8.6 Verification of Degrees of Protection — Test shall be done to verify conformity to 6.2 in accordance with the method given in IS : 2147-1962*.

*Degrees of protection provided by enclosures for low-voltage switchgear and controlgear.

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Patliputra Industrial Estate, PATNA 800013	6 23 05
T.C., No. 14/1421, University P.O., Palayam TRIVANDRUM 695035	{ 6 21 04 6 21 17

Inspection Offices (With Sale Point):

Pushpanjali, First Floor, 205-A West High Court Road, Shankar Nagar Square, NAGPUR 440010	2 51 71
Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

*Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep 27 68 00
Street, Calcutta 700072

†Sales Office in Bombay is at Novelty Chambers, Grant Road, 89 65 28
Bombay 400007

‡Sales Office in Bangalore is at Unity Building, Narasimharaja Square, 22 36 71
Bangalore 560002