

**भारतीय मानक**  
**Indian Standard**

**IS 2418 (Part 1) : 2018**

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**सामान्य प्रकाश सेवाओं के लिए**  
**प्रतिदीप्ति नलिकाकार लैंप**

भाग 1 सुरक्षा अपेक्षाएँ  
( दूसरा पुनरीक्षण )

**Tubular Fluorescent Lamps for**  
**General Lighting Service**

Part 1 Safety Requirements

( *Second Revision* )

ICS 621.327.534.15:620.1

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July 2018

Price Group 4

Lamps and Related Equipments Sectional Committee, ETD 23

FOREWORD

This Indian Standard (Part 1) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lamps and Related Equipments Sectional Committee had been approved by the Electrotechnical Division Council.

This standard (Part 1) was first published in 1964. The first revision was published in 1977. This revision has been undertaken with a view to upgrade many of the essential characteristics of double-capped fluorescent lamps (tubular fluorescent lamps) and primarily to align the existing standard with latest International Standard.

This standard specifies the requirements and method of tests to be followed in determining the safety, including method of sampling and conditions of compliance.

This standard is based on IEC publication 61195 (1999) 'Specification for double-capped fluorescent lamps for general lighting service' issued by the International Electrotechnical Commission except for the following modification:

Lamps with G 5 and G 13 caps have been covered in this standard

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 or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## TUBULAR FLUORESCENT LAMPS FOR GENERAL LIGHTING SERVICE

### PART 1 SAFETY REQUIREMENTS

#### ( Second Revision )

#### 1 SCOPE

This standard (Part 1) specifies the safety requirements for double-capped fluorescent lamps, commonly known as tubular fluorescent lamps of G5 and G13 caps for general lighting purposes.

NOTE — Compliance with this standard concerns only safety criteria and does not take into account the performance of double-capped fluorescent lamps for general lighting purposes with respect to luminous flux, colour, starting and operational characteristics as specified in IS 2418 (Part 2).

#### 2 REFERENCES

The following standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
1534 (Part 1) : 1977	Ballasts for fluorescent lamps : Part 1 For switch start circuits
1885 (Part 16/ Sec 3) : 1967	Electrotechnical vocabulary: Part 16 Lighting, Section 3 Lamps and auxiliary apparatus
2418	Tubular fluorescent lamps for general lighting service:
(Part 2) : 2017	Performance requirements ( <i>under preparation</i> )
(Part 3) : 1977	Dimensions of G-5 and G-13 bi-pin caps
(Part 4) : 1977	Go and no-go gauges for G-5 and G-13 bi-pin caps
2500 (Part 1) : 2000	Sampling procedures for inspection by attributes : Part 1 Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
10322 (Part 1) : 2014	Luminaires : Part 1 General requirements and tests
11000 (Part 2/ Sec 1) : 2008	Fire hazard testing: Part 2 Test methods, Section 1 Glow-wire apparatus and common test procedure
15585 (Part 2/ Sec 8) : 2011	Safety of lamp controlgear : Part 2 Particular requirements, Section 8 Ballasts for fluorescent lamps

#### 3 TERMINOLOGY

For the purposes of this standard, the following definitions in addition to those given in IS 1885 (Part 16/Sec 3) shall apply.

**3.1 Double-capped Fluorescent Lamp** — Double-capped low-pressure mercury discharge lamp of tubular form in which most of the light is emitted by a layer of fluorescent material excited by the ultra-violet radiation from the discharge.

**3.2 Group** — Lamps having the same electrical and cathode characteristics, the same physical dimensions and the same starting method.

**3.3 Type** — Lamps of the same group having the same photometric and colour characteristics.

**3.4 Family** — Lamp groups which are distinguished by common features of materials, components, lamp diameter and/or method of processing.

**3.5 Nominal Wattage** — Wattage used to designate the lamp.

**3.6 Type Test** — A test or series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard.

**3.7 Type Test Sample** — Sample consisting of one or more similar units, submitted by the manufacturer or responsible vendor for the purpose of a type test.

**3.8 Acceptance Test** — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

**3.9 Routine Test** — Tests carried out on each lamp to check requirements which are likely to vary during production.

**3.10 Batch** — All the lamps of one family and/or group identified as such and put forward at one time for testing to check compliance.

#### 3.11 Test Quantities

**3.11.1 Inspection Test Quantity (ITQ)** — The number of lamps selected for the purpose of determining the acceptability of a batch as to marking, mechanical and physical requirements, and starting characteristics.

#### 4 SAFETY REQUIREMENTS

##### 4.1 General

Lamps shall be so designed and constructed that in

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normal use they present no danger to the user or surroundings.

In general, compliance is checked by carrying out all the tests specified.

NOTE — Where testing can become unnecessarily difficult due to the lamp length, methods to resolve the problem may be agreed between the manufacturer or the supplier and the certification authority.

### 4.2 Marking

4.2.1 The following information shall be legibly and durably marked on the lamps:

- a) mark of origin (this may take the form of a trade-mark, the manufacturer's name or the name of the responsible vendor);
- b) the nominal wattage (marked "W" or "watts") or any other indication which identifies the lamp;
- c) length of the lamp (optional); and
- d) country of manufacture.

4.2.2 Compliance is checked by the following:

- a) presence and legibility of the marking by visual inspection; and
- b) durability of marking by applying the following test on unused lamps.

The area of the marking on the lamp shall be rubbed by hand with a smooth cloth dampened with water for a period of 15 s.

After this test, the marking shall still be legible.

4.2.3 The lamp may also be marked with the Standard Mark.

4.2.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 2016* and the rules and regulations made thereunder. The details of conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

### 4.3 Mechanical Requirements for Caps

#### 4.3.1 Construction and Assembly

Caps shall be so constructed and assembled to the bulbs that they remain attached during and after operation.

4.3.1.1 Compliance is checked by the following tests.

For unused lamps compliance is checked by applying a torque test to the pins, as follows:

- a) the lamp cap shall remain firmly attached to the bulb and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6°

when subjected to the torque levels specified in Table 1.

**Table 1 Torque Values for Unused Lamps**  
(Clause 4.3.1.1)

Sl No.	Cap Type	Torque Value Nm
(1)	(2)	(3)
i)	G5	0.5
ii)	G13	1.0

The torque shall not be applied suddenly but shall be increased progressively from zero to the value specified in Table 1. The test holders for the application of the torque are shown in Annex A.

- b) Following a heating treatment for a period of 2 000 h  $\pm$  50 h at a temperature of 120 °C  $\pm$  5 °C, the cap shall remain firmly attached to the glass shell/tube and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6° when subjected to the torque levels specified in Table 2.

For G13 capped lamps with a nominal wattage greater than 36 W, the heating shall be performed at a temperature of 140 °C  $\pm$  5 °C.

**Table 2 Torque Values after Heating Treatment**  
(Clause 4.3.1.1)

Sl No.	Cap Type	Torque Value Nm
(1)	(2)	(3)
i)	G5	0.3
ii)	G13	0.6

#### 4.3.2 Dimension of Caps

4.3.2.1 Lamps shall use standardized caps in accordance with the requirements of IS 2418 (Part 3).

4.3.2.2 Compliance is checked by using the gauges specified in IS 2418 (Part 4) and shown in Table 3.

**Table 3 Data Sheet References of IS 2418 (Part 3 and Part 4)**  
(Clauses 4.3.2.2 and 4.8.1)

Sl No.	Cap Type	Sheet Numbers	
		IS 2418 (Part 3) Lamp Caps	IS 2418 (Part 4) Gauges
(1)	(2)	(3)	(4)
i)	G5	Table 1	Table 1 and 2
ii)	G13	Table 2	Table 3 and 4

#### 4.4 Insulation Resistance

4.4.1 The insulation resistance between the metal shell of the cap and the pin(s) or contacts shall not be less than  $2M\Omega$ .

4.4.2 Compliance is checked by measurement with suitable test equipment using a d.c. voltage of 500 V.

#### 4.5 Electric Strength

4.5.1 This test shall not apply to lamps having caps with internal resistors.

4.5.2 The insulation between the shell of the cap and the pin(s) or contacts shall withstand the test voltage. No flash-over or breakdown shall occur during the test.

4.5.3 Compliance is checked with a 1 500 V a.c. voltage of substantially sine-wave form, with a frequency of 50 Hz and applied for 1 min. Initially, not more than half the prescribed voltage shall be applied; it shall then be raised rapidly to the full value.

Glow discharges without a drop in voltage are neglected.

#### 4.6 Parts Which can Become Accidentally Live

4.6.1 Metal parts intended to be insulated from live parts shall not be or become live.

4.6.2 With the exception of cap pins no live part shall project from any part of the cap.

4.6.3 Compliance is checked by a suitable measuring system which may include visual inspection where appropriate.

#### 4.7 Resistance to Heat and Fire

4.7.1 Insulating material of caps shall be resistant to heat.

4.7.2 Compliance is checked by the following test.

Samples are tested in a heating cabinet at a temperature of  $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$  for a period of 168 h.

For G13 caps to be used on lamps with a nominal wattage greater than 36 W, the samples shall be tested at a temperature of  $140^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

At the end of the test, the samples shall not have undergone any change impairing their further safety, especially in the following respects:

- a) reduction in the protection against electric shock as required in 4.4 and 4.5;
- b) loosening of cap pins, cracks, swelling and shrinking as determined by visual inspection.

At the end of the test, the dimensions shall comply with the requirements of 4.3.2.

4.7.3 External parts of insulating material shall be resistant to abnormal heat and to fire.

4.7.4 Compliance is checked by the following test.

Parts are subjected to a test using a nickel-chromium glow-wire heated to  $650^{\circ}\text{C}$ . The test apparatus shall be that described in IS 11000 (Part 2/Sec 1).

The sample to be tested is mounted vertically on the carriage and pressed against the glow-wire tip with a force of 1 N, preferably 15 mm or more from the upper edge of the sample. The penetration of the glow-wire into the sample is mechanically limited to 7 mm. After 30 s the sample is withdrawn from contact with the glow-wire tip.

Any flame or glowing of the sample shall extinguish within 30 s of withdrawing the glow-wire and any burning or molten drop shall not ignite a piece of tissue paper consisting of five layers spread out horizontally 200 mm  $\pm$  5 mm below the sample.

The glow-wire temperature and heating current shall be constant for 1 min prior to commencing the test. Care shall be taken to ensure that heat radiation does not influence the sample during this period. The glow-wire tip temperature is measured by means of a sheathed fine-wire thermocouple constructed and calibrated as described in IS 11000 (Part 2/Sec 1).

NOTE — Precautions should be taken to safeguard the health of personnel conducting tests against risk of

- a) explosion or fire;
- b) inhalation of smoke and/or toxic products; and
- c) toxic residues.

#### 4.8 Creepage Distance for Caps

4.8.1 The minimum creepage distance between contact pin(s) or contacts and the metal shell of the cap shall be in accordance with the requirements in IS 2418 (Part 3). Relevant cap standard are given in Table 3.

4.8.2 Compliance is checked by measurement in the most onerous position.

#### 4.9 Lamp Cap Temperature Rise

4.9.1 For lamps using caps G5 and G13, and designed for operation with the use of a starter, the lamp cap temperature rise above ambient temperature shall not exceed 95 K (*see* Fig. 1).

4.9.2 Compliance is checked by the procedure specified in Annex B.

4.9.3 Where it can be shown that one lamp group produces the highest cap temperature rise for a given lamp family, for example a lamp with a 26 mm nominal bulb diameter, only tests on this one lamp group are necessary to show compliance for all identically capped lamps.

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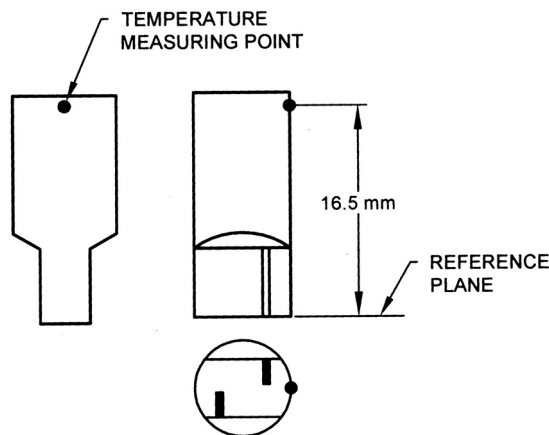


FIG. 1 TEMPERATURE MEASURING POINT

### 4.10 Lamp Minimum Overall Length

4.10.1 To ensure retention in luminaires, lamps shall comply with a minimum overall length specified in relevant data sheet given in IS 2418 (Part 2) having the dimension as  $B_{\min} - 0.2$  mm.

4.10.2 Compliance is checked by measurement.

### 4.11 Information for Luminaire Design

Refer to Annex C.

### 4.12 Information for Ballast Design

Refer to Annex D.

## 5 SELECTION OF LAMPS FOR TESTS (SAMPLING)

### 5.1 Method of Selection

The inspection test quantities specified in the following clauses shall be selected in a mutually agreed manner such as to ensure proper representation of the batch.

5.1.1 The selection of lamps for individual batches should be made as follows:

- Up to and including 20 containers per batch* — Out of every container an equal number of lamps (or as near to equal as possible) shall be selected at random in order to obtain the 20 lamps required.
- Over 20 containers per batch* — Out of 20 containers, evenly distributed over the whole batch, one lamp shall be selected at random from each container to obtain the 20 lamps required.

NOTE — Methods for the selection of lamps for type testing are under consideration.

### 5.2 Inspection Test Quantity (ITQ)

Inspection test quantity shall consist of 20 lamps.

### 5.3 Accidentally Broken and/or Incorrectly Operated Lamps

Lamps which are accidentally broken and/or have been operated in conjunction with incorrect controlgear before the life test is completed shall, when necessary, be replaced to ensure that the required number of ten lamps completes the test.

Any such broken or incorrectly operated lamps shall be neglected in the calculation of life test results.

NOTE — In order to avoid unnecessary delay it is recommended that spare lamps be available through the tests.

## 6 CONDITIONS OF COMPLIANCE

### 6.1 General Conditions

A batch shall be considered as conforming to this standard if the requirements contained in this standard are fulfilled. If the batch fails to satisfy the requirements as given in this standard, it shall be deemed not to comply with this standard.

### 6.2 Tests for Inspection Test Quantity

6.2.1 Following shall constitute tests for inspection test quantity:

- Marking (4.2),
- Torsion test for unused lamps [4.3.1.1 (a)],
- Dimensions of caps (4.3.2),
- Insulation resistance (4.4),
- Electric strength (4.5),
- Parts which can become accidentally live (4.6), and
- Overall length (4.10).

A batch shall be considered to comply with the requirements of 4.2, 4.3.1.1(a), 4.3.2, 4.4, 4.5, 4.6 and 4.10, if the number of lamps failing does not exceed qualifying limits given below:

- a) For any single requirement : 2 Max
- b) For all requirements taken together : 4 Max

## 7 TESTS

### 7.1 Classification of Tests

#### 7.1.1 Type Tests

The following shall constitute the type tests to be carried out on selected samples of tubular fluorescent lamps, samples being drawn preferably from regular production lot:

- a) Marking (4.2),
- b) Torsion test for unused lamps [4.3.1.1 (a)],
- c) Torsion test — at 2 000 h [4.3.1.1 (b)],
- d) Insulation resistance (4.4),
- e) Electric strength (4.5),
- f) Parts which can become accidentally live (4.6),
- g) Resistance to heat and fire (4.7),
- h) Creepage distance for caps (4.8), and
- j) Lamp cap temperature rise (4.9).

**7.1.1.1** The number of sample shall be as given for ITQ in respect of tests for 4.2, 4.3.1.1 (a), 4.4, 4.5 and 4.6 and their criterion for acceptance is given in 6.2.

**7.1.1.2** The number of samples for torsion test — at 2 000 h [4.3.1.1 (b)], resistance to heat and fire (4.7) and creepage distance for caps (4.8) shall be one and no failures are allowed in any of these tests.

**7.1.1.3** The number of samples for lamp cap temperature rise (4.9) shall be five from which not more than one shall fail.

#### 7.1.2 Acceptance Test

The following shall constitute as acceptance tests:

- a) Marking (4.2),
- b) Torsion test for unused lamps [4.3.1.1 (a)],
- c) Dimensions of caps (4.3.2),
- d) Insulation resistance (4.4),
- e) Electric strength (4.5),
- f) Parts which can become accidentally live (4.6), and
- g) Lamp cap temperature-rise (4.9).

**7.1.2.1** The number of sample shall be as given for ITQ in respect of tests for 4.2, 4.3.1.1 (a), 4.3.2, 4.4, 4.5, and 4.6 and their criterion for acceptance is given in 6.2.

**7.1.2.2** The number of samples for lamp cap temperature-rise (4.9) shall be five from which not more than one shall fail.

#### 7.1.3 Routine Tests

The following shall constitute the routine tests and shall be carried out on each lamp:

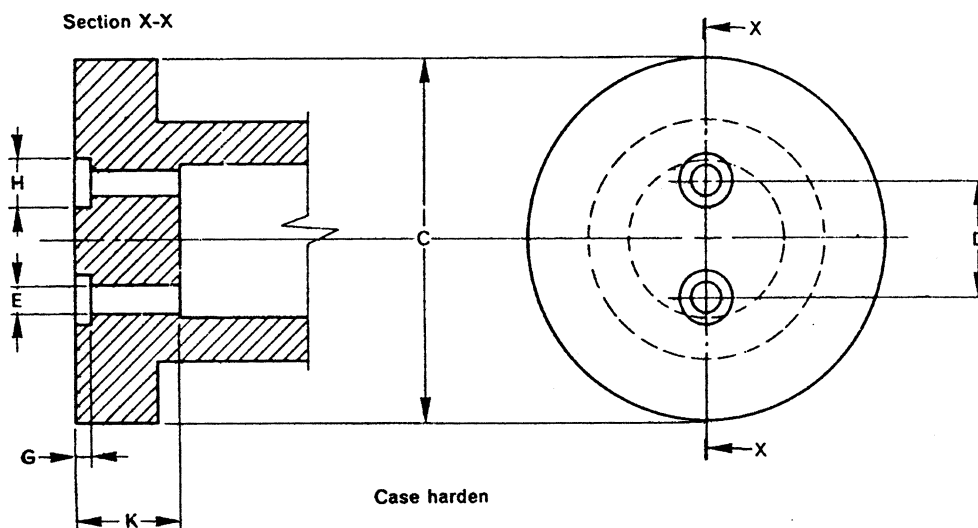
- a) Marking (4.2),
- b) Torsion test for unused lamps [4.3.1.1 (a)],
- c) Dimensions of caps (4.3.2),
- d) Insulation resistance (4.4),
- e) Electric strength (4.5),
- f) Parts which can become accidentally live (4.6), and
- g) Overall length (4.10).

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ANNEX A

(Clause 4.3.3.1)

TEST HOLDER FOR TORSION TEST FOR G5 AND G13 CAPPED LAMPS



Dimension	G5 mm	G13 mm	Tolerance mm
C	16.0	36.0	Minimum
D	4.75	12.7	±0.03
E	2.8	2.8	+0.3
G	1.5	1.5	Approximate
H	4.0	4.0	Approximate
K	4.8	7.8	Minimum

NOTE — The drawing illustrates the essential dimensions of the holder which need only be checked if doubt arises from the application of the test.

FIG. 2 HOLDER FOR TORSION TESTS ON LAMPS WITH BI-PIN CAPS

In order to ensure appropriate engagement between the cap and holder during the test, a locating device shall be fitted at a suitable distance from the holder to provide

adequate support for the lamp.

The face of the cap shall be in close contact with the face of the special holder.



## ANNEX B

(Clause 4.9.2)

### TEST FOR LAMP CAP TEMPERATURE RISE

**B-1** The test shall be carried out under the conditions specified in **B-2** to **B-7**. The circuit shall use the appropriate reference ballast as specified in IS 1534 (Part 1).

**B-2** The supply voltage shall be 110 percent of the rated voltage of the reference ballast with the starter circuit continuously closed.

**B-3** The test lamp shall be a normal production lamp but specially produced such that its cathodes are deactivated, that is without cathode emitter.

**B-4** The test lamp, in a bare condition, shall be

suspended by means of nylon slings, in draught-free air, at  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . The plane through the cap pins shall be horizontal.

**B-5** The electrical connections to the lamp shall be through  $1 \text{ mm}^2 \pm 5$  percent copper wires attached to the cap pins.

**B-6** For G5 and G13 caps, the thermocouple shall be attached to the insulating material of the cap as close to the centre as possible.

**B-7** The test shall continue until a stable temperature is achieved.

## ANNEX C

(Clause 4.11)

### INFORMATION FOR LUMINAIRE DESIGN

#### C-1 GUIDELINES FOR SAFE LAMP OPERATION

To ensure safe lamp operation, it is essential to observe the following recommendations.

#### C-2 MAXIMUM LAMP CAP TEMPERATURE UNDER NORMAL OPERATING CONDITIONS

Relevant tests are given in IS 10322 (Part 1).

##### C-2.1 Lamps with G5 and G13 Caps

Luminaires should be so designed that with the intended lamp installed in the luminaire, the lamp cap temperature under normal operating conditions does not exceed  $120^{\circ}\text{C}$  at the cap rim and at the insulator material. For G13 capped lamps with a nominal wattage above 36 W, the maximum cap temperature should not exceed  $140^{\circ}\text{C}$ .

For the measurement of the cap rim temperature, the hot junction of the thermocouple should be located on the cap shell at a distance not more than 2 mm from the cap-to-glass junction.

For the measurement of the insulator material temperature, the hot junction of the thermocouple should be located on the insulator part of the cap face along the line through the cap pins as near as possible to the centre between the contact pins.

The thermocouple wires (diameter maximum of 0.2 mm each) should be insulated up to the place of attachment.

#### C-3 SPACING OF LAMPHOLDERS

The attention of luminaire designers is drawn to the dimensions for lampholder spacing specified in the relevant standard, if any.

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**ANNEX D**

*(Clause 4.12)*

**INFORMATION FOR BALLAST DESIGN**

**D-1 GUIDELINES FOR SAFE LAMP OPERATION**

To ensure safe lamp operation, it is essential to observe the following recommendations.

**D-2 LAMP END TEMPERATURE UNDER ABNORMAL OPERATING CONDITIONS**

In the case where a lamp does not start, any continuation of cathode preheating should not lead to overheating of the lamp ends.

In the case where one of the cathodes is depleted or broken, while the lamp continues to operate (partial rectification), overheating of the lamp ends should be prevented by suitable measures in the circuit.

**D-3 LIMITATION OF WORKING VOLTAGE**

For G5-capped lamps with diameter 16 mm, the working voltage between any lamp terminal and earth should not exceed 415 V r.m.s.

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## Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: ETD 23 (6906).

## Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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