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Indian Standard

SPECIFICATION FOR HOLDERS FOR STARTERS FOR TUBULAR FLUORESCENT LAMPS

(*First Revision*)

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Indian Standard

SPECIFICATION FOR HOLDERS FOR STARTERS FOR TUBULAR FLUORESCENT LAMPS

(First Revision)

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Indian Standard

SPECIFICATION FOR HOLDERS FOR STARTERS FOR TUBULAR FLUORESCENT LAMPS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 20 August 1982, after the draft finalized by the Electric Lamps and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Tubular fluorescent lamps are being increasingly used for general lighting services. The performance of fluorescent lamps is dependent on the characteristics of the auxiliaries with which the lamps are used. Starter for preheat type fluorescent lamp is one such auxiliary used to preheat the cathode filaments of the fluorescent lamps and for starting the discharge in conjunction with a ballast. With a view to ensuring interchangeability and safety, need has been felt for laying down the dimensional and other requirements of holders used with starters for fluorescent lamps.

0.3 This standard was first published in 1965. This revision has been undertaken to upgrade many of the requirements for the holders in view of the development in the technology and to bring it in line with the IEC Publication : 400-1972 Lampholders and starterholders for tubular fluorescent lamps. Opportunity has also been taken in the revision to include plug gauges for checking the dimensions and contact making of the holders which were not covered in the earlier standard.

0.4 In the preparation of this specification assistance has been taken from the IEC Pub 400-1972 'Lampholders and starterholders for tubular fluorescent lamps' issued by International Electrotechnical Commission.

0.5 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*. 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 lays down the dimensional, safety and performance requirements of holders for two-pin type starters covered by IS : 2215-1968†. The holders are intended for use in circuits connected to an ac supply not exceeding 250 V to earth and not exceeding 660 V when the lamp is removed.

1.1.1 This standard does not cover starter holders designed for special purposes, such as waterproof type, flameproof type, etc.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

2.1 Rated Voltage — A voltage assigned to the holder by the manufacturer to indicate the highest working voltage for which the holder is intended.

2.2 Working Voltage — The highest rms voltage which may occur across any insulation, transients being disregarded, both when the lamp or starter is operating under normal conditions and when the lamp or starter is removed.

2.3 Starter Holder — An accessory used for connecting a starter to a fluorescent lamp circuit.

2.4 Built-in Holder — A holder exclusively designed to be built into luminaires, additional enclosures or the like.

2.5 Independent Holder — A holder so designed that it can be safely mounted separately from a luminaire and provides all the necessary protection according to its classification and marking.

2.6 Live Part — A part which has a potential difference above the earth of the same order of magnitude (that is, between 1/10 of the full value and the full value) as the mains voltage.

2.7 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 specification.

*Rules for rounding off numerical values (*revised*).
†Specification for starters for fluorescent lamps (*second revision*).

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

2.9 Routine Test — Tests carried out on each item to check requirements which are likely to vary during production.

3. MATERIAL, CONSTRUCTION AND WORKMANSHIP

3.1 Material

3.1.1 All materials used in the construction of the holder shall be suitable for tropical use. No hygroscopic materials shall be used unless they have been previously rendered moisture-proof.

3.1.2 External parts of the holder shall be made of insulating material. The insulating material used shall be non-flammable and able to withstand the temperatures likely to occur in the starter holder assembly during normal use.

3.1.3 Non-ferrous metallic parts of the holder shall not be brittle.

3.2 Construction — The starter holders shall be so designed and constructed as to be mechanically robust and free from any operational difficulties. They shall be designed to ensure safe and easy functioning under normal conditions They shall be so constructed as to be capable of withstanding the shocks met within normal transit, installation, and use. They shall have adequate resistance to heat. All exposed metal parts likely to be affected by atmospheric conditions shall be adequately protected to prevent corrosion.

3.2.1 Provisions, if any, for fixing the holders shall be such that the fixed part of the holders cannot be turned or displaced during normal use.

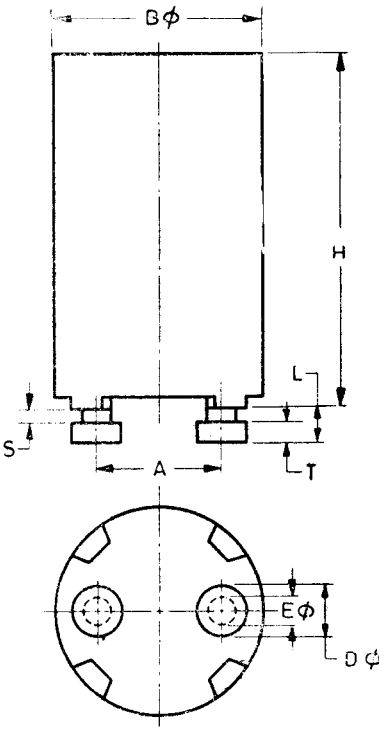
3.2.2 Starter holders shall be so designed that a starter can be easily inserted and removed and cannot work loose due to vibration or temperature variation.

Provisions for fixing holders shall be such that the fixed part of the holder cannot be turned or displaced.

3.2.3 Starter holders shall be checked by inspection and by manual test, using a test starter having the dimensions given in Fig. 1.

Starter holder dimensions shall comply with the dimensions shown in Fig. 2.

3.2.4 Starter holders shall also be checked with the help of plug gauges shown in Figs. 3, 4 and 5 for the requirements as mentioned in these figures.

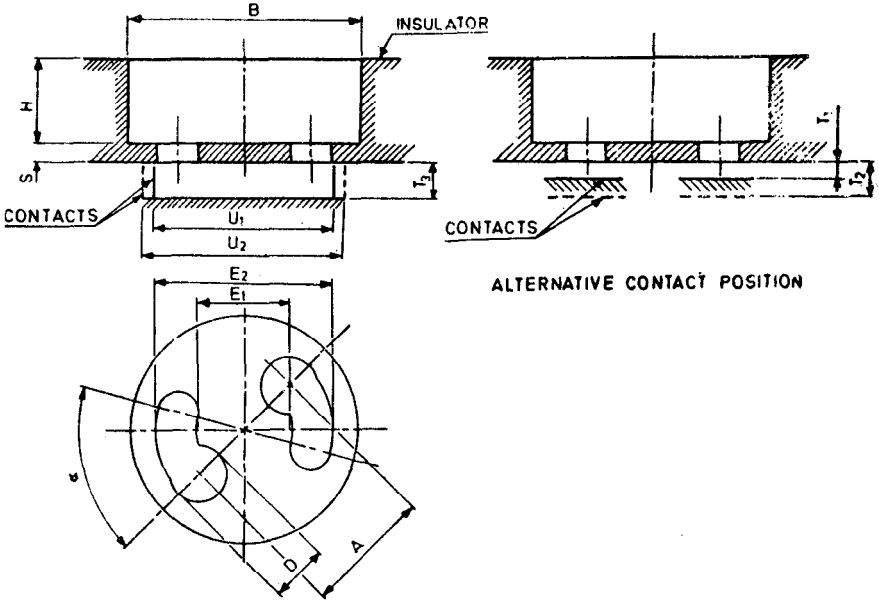


All dimensions in millimetres.

Dimension	Minimum	Maximum
A	12·5	12·9
B	—	21·5
D	4·7	5
E	2·8	3·2
H	33·0	36·0
L	—	4·3
S	1·7	—
T	1·9	2·2

Note — The figure is intended only to indicate the dimensions to be controlled

Fig. 1 Dimensions of Test Starter



All dimensions in millimetres.

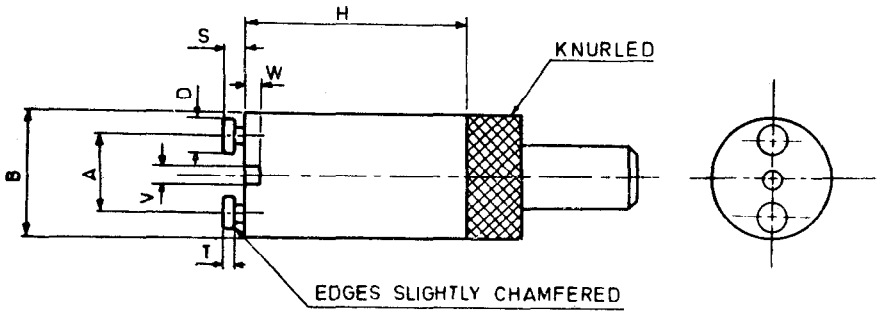
Reference	Minimum	Maximum
A	12·5	12·9
B	21·7	—
D	5·4	—
E_1	8·7	9·2
E_2	16·2	16·7
H	—	28·0
S	—	1·5
T_1 (1)	—	1·5
T_2 (2)	2·5	—
T_3	2·3	—
U_1 (1)	—	17·0
U_2 (2)	18·0	—
α	45°	—

(1) Rest position of contacts.

(2) Contacts fully depressed.

Note — The drawing is intended only to indicate the dimensions to be controlled.

Fig. 2 Dimensions of Starter Holder



All dimensions in millimetres.

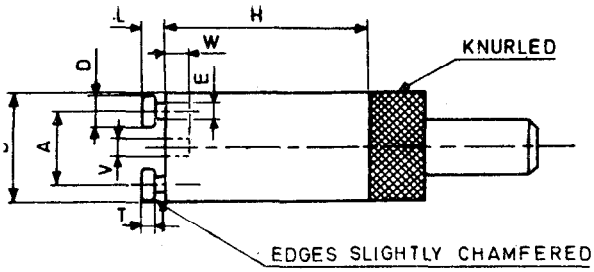
Reference	Dimension		Tolerance
	Gauge A	Gauge B	
A	12·90	12·50	± 0·005
B	21·5	21·5	— 0·01
D	5·0	5·0	— 0·01
E	3·2	3·2	— 0·01
H	38	38	Approx
S	1·7	1·7	— 0·01
T	2·2	2·2	— 0·01
V	2·7	2·7	— 0·01
W	2·5	2·5	— 0·01

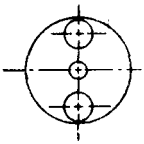
Note — The drawing is intended only to illustrate the essential dimensions of the gauge.

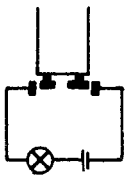
Purpose — To check starter holders with regard to the fit of a 'maximum' starter. Gauge A is also used for the torsion test.

Testing — Each of the gauges A and B shall in turn enter the starter holders smoothly until it reaches the normal operating position of a starter.

Fig. 3 'Go' Plug Gauge For Starter Holders







All dimensions in millimetres.

Reference	Dimension	Tolerance
A	12·70	± 0·005
B	20	± 0·1
D	4·5	— 0·01
E	2·6	— 0·01
H	38	*Approx*
L	4·3	— 0·01
T	1·9	— 0·01
V	3·0	+ 0·01
W	4	+ 0·1

Note — The drawing is intended only to illustrate the essential dimensions of the gauge.

Purpose — To check the retention and contact making of a "minimum" starter in a starter holder, the contact force being determined inter alia by the starter-pin spacing.

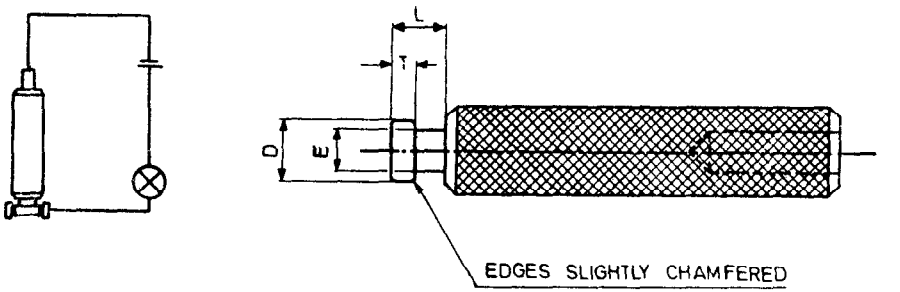
For starter holders in which the contact force is practically independent from the starter-pin spacing, the special plug gauge shown in Fig. 5 should be used.

Testing — The starter holder shall be assumed to be correct if the indicator lamp lights up when the gauge is inserted in the normal operating position of a starter.

In this position, the gauge shall be retained by the starter holder. This test shall be made after checking with the gauges.

Note — Mass of the gauge approx 75 g.

Fig. 4 Plug Gauge for Starter Holders for Testing Contact Making and Retention



All dimensions in millimetres.

Reference	Dimension	Tolerance
D	4·7	— 0·01
E	2·8	— 0·01
L	4·3	+ 0·01
T	1·9	— 0·01

Note — The drawing is intended only to illustrate the essential dimensions of the gauge.

Purpose — To check contact making in starter holders in which the contact force is practically independent from the starter-pin spacing.

Testing — When the gauge is inserted in both contacts in turn, the indicator lamp shall light without flickering in all possible positions of the gauge.

This test shall be made after checking with the gauges shown in Fig. 3.

Fig. 5 Special Plug Gauge for Starter Holder for Testing Contact Making

3.2.5 For starter holders, compliance shall be checked by inspection and for starter holders making contact mainly along one side of each pin of the starter, by measuring the contact force with a device made according to the dimensions of gauge A shown in Fig. 3.

3.2.5.1 The contact force shall be between 2 N and 15 N.

Note — The starter holders where the contact is made at the pin ends, a test for checking the contact force is under consideration.

3.2.6 If a rotary motion is necessary for the removal of the starter from the starter holder, the torque required is measured; it shall be between 0·05 Nm and 0·3 Nm.

3.2.6.1 Compliance shall be checked by the use of gauge A of Fig. 3.

3.3 **Workmanship** — All parts shall be manufactured in accordance with good engineering practice.

4. TERMINALS FOR EXTERNAL WIRING

4.0 Starter holders shall be provided with one of the following means of connection:

a) Terminals with screw clamping; and

b) Screwless terminals.

4.1 Terminals with Screw Clamping

4.1.1 All external terminals shall be of sufficient size relative to the current rating of the holder but in any case not less than 2 A.

4.1.2 All external terminals shall be so located that wiring becomes easy. They shall be so designed that they do not work loose when the clamping screws are tightened or loosened.

4.1.3 The terminals shall be so designed that connections are made with adequate pressure, the core or conductor being held between two metal surfaces and without damage to the conductor.

4.1.4 The terminals shall be so designed that the conductor does not slip out when the screw is tightened and they shall allow a wire to be connected without special perparation (such as soldering of the strands of the conductor, use of cable lugs, formation of eyelets, etc).

4.1.5 Terminals shall be so designed that the contact pressure is not transmitted through insulating material other than ceramic material.

4.2 Screwless terminals when used shall meet the requirements of IS : 6585-1972*.

4.3 Screw

4.3.1 Screws used in a terminal shall have metric thread (see IS : 4218-1967†) and shall not serve to fix any other component.

4.3.1.1 Screws used to clamp a conductor and screws with a nominal diameter less than 3 mm which may be used when connections are made, shall screw into a metal nut or metal insert.

4.3.1.2 A self-tapping screw shall not be used for any form of electrical connection.

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*Specification for screwless terminals and electrical connections for lighting fittings.

†ISO metric screw threads.

5. CREEPAGE DISTANCES AND CLEARANCES

5.1 Creepage distance between live parts of different polarity and between live parts and non-current carrying and/or accessible parts shall not be less than 3 mm measured over the surface of the insulation isolating the live parts.

5.2 In cases where there are no insulating materials isolating live parts of different polarity or live parts from non-current carrying and/or accessible metal parts, a clearance distance of air gap of not less than 3 mm in the former case and not less than 4 mm in the latter case shall be provided.

6. PROTECTION AGAINST ACCIDENTAL CONTACT OF LIVE PARTS

6.1 Starter holders shall be so designed that it shall not be possible to touch one of the starter pins while the other pin is touching one contact in the holder during insertion or removal of the starter.

6.1.1 Independent type holders shall have no openings giving access to live parts except those required for the connection and use of the holder. Such openings as are provided shall be so designed that there is sufficient protection against accidental contact when the holder is installed as in normal use.

NOTE — Lacquer or enamel shall not be accepted as adequate protection or insulation for the purpose of this requirement.

6.2 Protective enclosures and similar parts employed to prevent accidental contact with a live part shall have adequate mechanical strength and shall not work loose in normal use. It shall not be possible to remove such parts without the use of tools.

6.3 External wiring terminals used in holders shall be so designed that when wires are correctly fitted there is no possibility of accidental contact between live parts and accessible metal parts.

6.4 Built-in type holder shall satisfy the requirements of **6.1** to **6.3** when mounted in the enclosure(s) (for example, lighting fitting) for which they are designed.

7. MOISTURE RESISTANCE

7.1 The starter holders shall be proof against humid conditions which may occur in use. They shall withstand satisfactorily the moisture resistant test specified in **9.8**.

8. MARKING

8.1 Each starter holder shall be marked, legibly and indelibly with the following:

a) Manufacturer's name or trade-mark,

b) Model or type designation,

c) Rated current in amperes (this shall be atleast 2 A),

d) Rated voltage in volts (this shall be at least 250 V), and

e) Country of manufacture.

NOTE — Figures only may be used for marking the rated voltage and the rated current, in which case the rated current is to be placed before or above the rated voltage. The following alternatives are suggested:

$$2\ \text{A}\ 250\ \text{V or}\ 2/250\ \text{or}\ \frac{2}{250}$$

8.1.1 The starter holders may also be marked with Standard mark.

8.1.2 The use of the Standard Mark is govered by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9. TESTS

9.1 Classification of Tests

9.1.1 *Type Tests* — The following shall constitute type tests:

a) Visual examination test (*see* **9.2**);

b) Test for accidental contact of live parts (*see* **9.3**);

c) Test for screw terminals (*see* **9.4**);

d) Test for mechanical strength (*see* **9.5**);

e) Impact test (*see* **9.6**);

f) Test for measurement of contact pressure or torque (*see* **9.7**);

g) Test for moisture resistance (*see* **9.8**);

h) Endurance test (*see* **9.9**);

j) Test for performance (*see* **9.10**);

k) Test for creepage distances and clearances (*see* **9.11**);

m) Non-flammability test (on moulded insulating materials only) (*see* **9.12**);

n) Test for corrosion (on ferrous parts only) (*see* **9.13**);

p) Test for brittleness (on non-ferrous parts only) (*see* **9.14**); and

r) Test for heat resistance (*see* **9.15**).

9.1.1.1 *Number of samples and sequence of tests* — The type tests in accordance with this standard shall constitute of checking all the requirements specified in this standard. At least 6 samples of the same type shall be submitted for type tests. The tests shall be carried out in accordance with the sequence given in Appendix A.

9.1.1.2 *Conditions of acceptence* — The type test shall be considered as conforming to the requirements of this standard if no failure occurs in any of the tests. If one or more failures occur in any of the test(s), another set of six samples shall be selected and subjected to all test(s) when no failure shall occur for proving conformity to this standard.

9.1.2 *Acceptance Tests* — The following shall constitute acceptance tests to be carried out on number of samples selected at random from each lot:

a) Visual examination (*see* **9.2**);

b) Test for accidental contacts of live parts (*see* **9.3**);

c) Test for mechanical strength (*see* **9.5**);

d) Insulation resistance dry test (*see* **9.8.3.**);

e) High voltage test (*see* **9.8.4**);

f) Endurance test (*see* **9.9**); and

g) Test for performance (*see* **9.10**).

9.1.2.1 The sampling procedure and criteria of acceptance shall be subject to agreement between the supplier and the purchaser. In the absence of such an agreement, the sampling procedure detailed in Appendix B may be followed.

9.1.3 *Routine Tests* — The following tests shall be carried out on all lampholders:

a) Visual examination test (*see* **9.2**); and

b) High voltage test (*see* **9.8.4**).

NOTE — As a routine test, the high voltage test may be carried out in the form of flash test, the ac test voltage of 2 000 V rms being applied for a period of five seconds between the parts specified in **9.8.3**, where there shall be no arcing or breakdown of insulation.

9.2 Visual Examination Test — The starter holder shall be visually examined and inspected for checking conformity with the relevant requirements specified in this standard.

9.3 Test for Accidental Contact of Live Parts — It shall not be possible to touch any live parts by means of a test finger (*see* IS : 1401-1970*) fitted with an electrical contact indicator, applied in all possible directions

*Specification for accessibility test probes (*first revision*).

with a force of 50 N. It is recommended that a voltage of not less than 40 V is used with an indicator lamp for the indication of electrical contact.

9.4 Test for Screw Terminals

9.4.1 Screw terminals shall be tested by tightening and loosening the clamping screws 10 times by means of a suitable test screw driver applying a torque as indicated below :

Diameter of Screw	*Torque*, Nm	
mm	(a)	(b)
2·5	0·2	0·4
3	0·25	0·5
3·5	0·4	0 8
4	0·7	1·2
5	0·8	2·0
6	—	2·5

NOTE — Column (a) of the table refers to a screw without a head if it does not protrude from the hole when tightened. Column (b) refers to other screws.

9.4.1.1 Conductors of suitable cross-sectional area shall be placed in the terminals during the testing of the terminal screws and the conductors shall be slightly shifted after each loosening operation.

9.4.2 During this test no damage impairing the further use of screwed connections shall occur. Wires shall be considered to have been damaged if they show deep indentations or shearing. Compliance with **5.1** and **4.2** shall then be checked and the terminals shall show no signs of being loose after this test.

9.5 Test for Mechanical Strength — Starter holders with a gauge in position shall be subjected for 1 min to a force of 20 N applied to the gauge in the direction of the axis. The gauge shall comply with gauge A shown in Fig. 3.

9.6 Impact Test — The starter holder shall be placed on a horizontal plane and subjected to three blows from a suitable impact test apparatus. A typical apparatus is described in Appendix C.

9.6.1 After this test, the starter holder shall show no damage, specially no live parts shall have been made accessible.

9.7 Test for Measurement of Contact Pressure or Torque

9.7.1 *Contact Pressure* — This may be measured with any type of tension gauge.

9.7.1.1 *Procedure* — Place the feeler tip so as to lift the spring or pressure element from its top or to bring it to the desired position for measurement and read the indicated value. The value shall comply with **3.2.5.1.**

9.7.2 *Torque for Removal of the Starter* — This may be measured with a torque measuring apparatus.

9.7.2.1 *Procedure* — The apparatus consists of a spindle from which a weight hangs. An indicating needle or pointer which is connected to the spindle, is capable of moving over a half annular graduated scale with the rotation of the spindle. Jigs suitable for measuring starter holder torque (a test starter) are mounted on the spindle. As the starter holder after engagement rotates, the pointer moves over the scale showing the torque required to disengage the starter holder. The measured value shall comply with **3.2.**

9.8 Test for Moisture Resistance

9.8.1 The holders, having beed brought to a temperature of 27 ± 2°C shall be placed for 48 hours in a chamber having a relative humidity of 95 ± 2 percent at a temperature of 27 ± 2°C.

9.8.2 Immediately after the treatment as in **9.8.1**, the insulation resistance of the starter holder shall be measured according to **9.8.3** after removing visible drops of water, if any, with the aid of blotting paper but without heating.

NOTE — For the purpose of acceptance tests humidity treatment mentioned in **9.8.1** and **9.8.2** shall not be carried out.

9.8.3 The insulation resistance shall be measured one minute after the application of a dc voltage of 500 V between:

a) live parts of different polarity which may be separated, and

b) live parts and all external metal parts including fixing screws.

The insulation resistance measured shall not be less than two megohms.

9.8.4 After the test mentioned in **9.8.3,** the high voltage test described in **9.8.4.1** to **9.8.4.3** shall be carried out.

9.8.4.1 The holders shall satisfactorily withstand the application of an ac voltage 2 000 volts at 50 Hz between the parts specified in **9.8.3** without breakdown or arcing.

9.8.4.2 The initial voltage shall not exceed 30 percent of the full test voltage and shall be increased uniformly to the full voltage within 30 seconds. The full test voltage shall be maintained for one minute after

which the test voltage shall be diminished rapidly to 30 percent of its full value before switching it off.

9.8.4.3 The high voltage transformer used for the test shall have a rating of at least 500 VA.

9.9 Endurance Test — A test starter (*see* **Fig.** 1), with its contact short-circuited, shall be inserted 100 times into and withdrawn 100 times from the starter holder at a rate of about 30 times per minute, the starter holder being connected to an ac supply at rated voltage and the circuit arranged to pass the rated current, the power factor being 0·6 approximately.

9.9.1 After the test the starter holder shall show no damage.

9.10 Test for Performance — A test starter (*see* Fig. 1), with its contact short-circuited, shall be fitted to the starter holder and the starter holder be loaded for one hour with the rated current in a circuit of not more than 6 V.

9.10.1 The voltage drop across each starter holder contact, measured at the end of the one hour period specified shall not exceed 35 mV.

9.11 Test for Creepage Distances and Clearances — Compliance with the requirements of creepage distances and clearances (*see* 5) shall be checked by measurement. The measurement shall be made on the starter holders with and without the connecting wires to its terminals. Terminal nuts and other parts used to secure the conductors shall, if free to move, be turned to its most unfavourable position.

9.12 Non-flammability Test — This test is applicable only to moulded insulating materials. The test shall be carried out in accordance with Appendix D.

NOTE — This test need not be carried out on the finished holders if this has been done at the material stage.

9.13 Test for Corrosion

9.13.0 This test is applicable only to ferrous parts. Small helical springs and other similar parts as well as parts exposed to abrasion need not be subjected to this test. A layer of grease on such parts is deemed to provide sufficient rust protection.

9.13.1 All greases shall be removed from the parts to be tested by immersion in carbon tetrachloride for 10 minutes. The parts shall then be immersed for 10 minutes in an aqeous solution of 10 percent ammonium chloride at a temperature of 27 ± 5°C.

9.13.2 Without drying, but after shaking off any drops of the solution, the parts shall then be placed for 10 minutes in a box containing air saturated with moisture at a temperature of 27 ± 5°C. The samples shall

then be dried for 10 minutes in a heating cabinet at a temperature of 100 ± 5°C.

9.13.3 At the end of this treatment, surfaces shall show no signs of corrosion.

9.13.3.1 Traces of corrosion on sharp edges and a yellowish film removable by rubbing should be ignored.

9.14 Test for Brittleness

9.14.0 This test is applicable only to non-ferrous parts.

9.14.1 The parts shall be carefully cleaned with acetone, petroleum spirit or some other suitable solvent so that all traces of varnish, grease and oil are removed. The parts shall then be kept for one hour in a saturated solution of mercury chloride in water, at a temperature of 27 ± 5°C. After this treatment the parts shall be washed in running water.

9.14.2 There shall be no sign of cracks after 24 hours.

9.15 Test for Heat Resistance — The test shall be conducted in accordance with Appendix E.

APPENDIX A

(*Clause* 9.1.1.1)

SEQUENCE AND NUMBER OF SAMPLES FOR TYPE TEST

↓

6 Samples

↓

Visual examination (*see* **9.2**)

↓

Test for accidental contact of live parts (*see* **9.3**)

↓

Test for screw terminals (*see* **9.4**)

↓

Test for mechanical strength (*see* **9.5**)

↓

Impact test (*see* **9.6**)

↓

Test for measurement of contact pressure or torque (*see* **9.7**)

↓

Moisture resistance test (*see* **9.8**)

↓

Endurance test (*see* **9.9**)

↓

Test for performance (*see* **9.10**)

↓

3 Samples	3 Samples
↓	↓
Test for creepage distances and clearances (*see* **9.11**)	Test for heat resistance (*see* **9.15**)
↓	
Non-flammability test (on moulded insulating materials only) (*see* **9.12**)	
↓	
Corrosion test (on ferrous parts only) (*see* **9.13**)	
↓	
Brittleness test (on non-ferrous parts only) (*see* **9.14**)	

APPENDIX B

(*Clause* 9.1.2.1)

SAMPLING OF STARTER LAMP HOLDERS

B-1. LOT

B-1.1 In any consignment, all the starter holders of the same type and size manufactured by the same factory and during the same period shall be grouped together to constitute a lot. Each lot shall, however, consist of maximum of 1000 of bi-pin holders.

B-1.2 From each lot a certain number of starter holders as specified in Table 1 shall be selected at random and subjected to acceptance tests. For this purpose IS : 4905-1968* shall be used.

TABLE 1 SAMPLING SCHEME

Lot Size	First Stage N_1	Second Stage N_2	($N_1 + N_2$)	C_1	C_2
(1)	(2)	(3)	(4)	(5)	(6)
Up to 100	3	3	6	0	2
101 " 300	8	8	16	0	2
301 " 500	13	13	26	0	4
501 " 1 000	20	20	40	1	5

B-2. NUMBER OF TESTS AND RITERIA FOR CONFORMITY

B-2.1 In Table 1, N_1 is the size of the first stage sample. These samples shall be selected at random. A sample shall be declared defective if it fails in one or more of the acceptance tests. If the number of defectives found in this sample is less than or equal to C_1, the lot shall be considered as conforming to this standard and accepted. If the number of defectives is greater than or equal to C_2, the lot shall be rejected. If the number of defectives is between C_1 and C_2, further sample of N_2 size shall be selected at random and subjected to acceptance tests.

B-2.1.1 If the number of defectives in the two samples combined is less than C_2, the lot shall be accepted, otherwise rejected.

*Methods for random sampling.

APPENDIX C

(*Clause* 9.6)

IMPACT TEST

C-1. DESCRIPTION OF APPARATUS

C-1.1 A typical impact apparatus is shown in Fig. 6.

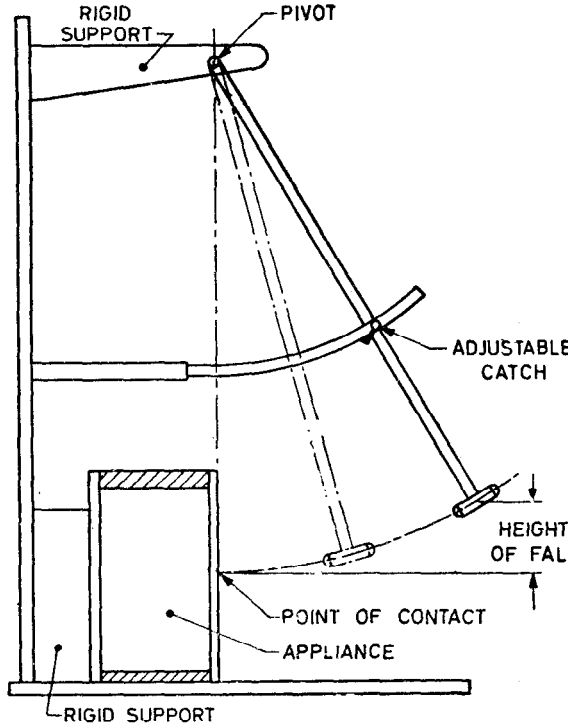


FIG. 6 IMPACT TEST APPARATUS

C-1.2 The striking element has a hemispherical face of radius 10 mm made of hardwood, polyamide or similar material weighing 0 15 kg. It is rigidly fixed to the lower end of a steel tube with an external diameter of 9 mm and thickness 0·5 mm which is pivoted at its upper end in such a way that it swings only in the vertical plane of the axis of the striking

element. The axis of the pivot is 1 000±1 mm above the axis of the striking element. The design of the apparatus is such that a force between 1·0 N and 2·0 N has to be applied to the face of the hammer to maintain the pendulum in a horizontal position.

C-2 PROCEDURE

C-2.1 The fitting under test is held against a solid of brick, concrete or the like, and the test apparatus is so arranged that the pivot of the pendulum is vertically above the point of impact of the hammer. The hammer is then allowed to fall from a height of 200 mm.

C-2.2 The height of the fall is measured vertically between the point of impact on the sample and the face of the hammer at the point of release.

C-2.3 Three blows shall be applied to points evenly distributed over the sample.

C-3. REQUIREMENT

C-3.1 After the test, the samples shall show no damage within the meaning of this standard.

APPENDIX D

(*Clause* 9.12)

TEST FOR NON-FLAMMABILITY

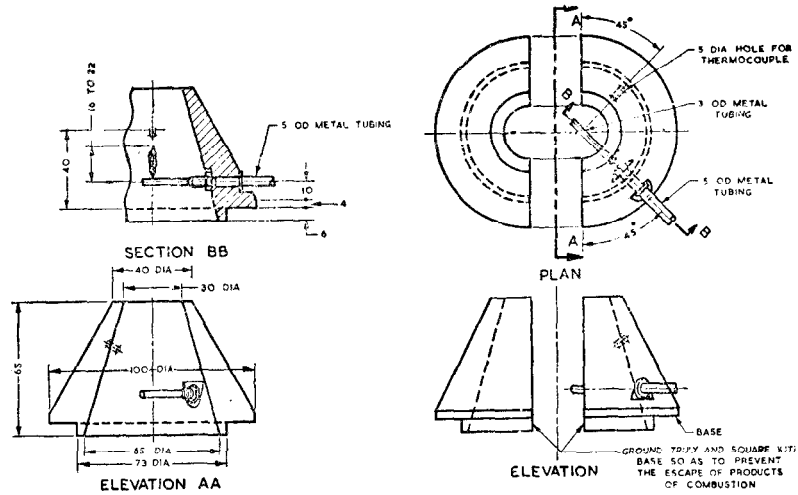
D-1. PREPARATION OF SAMPLE

D-1.1 The specimen shall consist of a portion of moulded insulating material and shall weigh not less than 6 g nor more than 10 g, and shall be not more than 10 mm in thickness measured from an externally cured face.

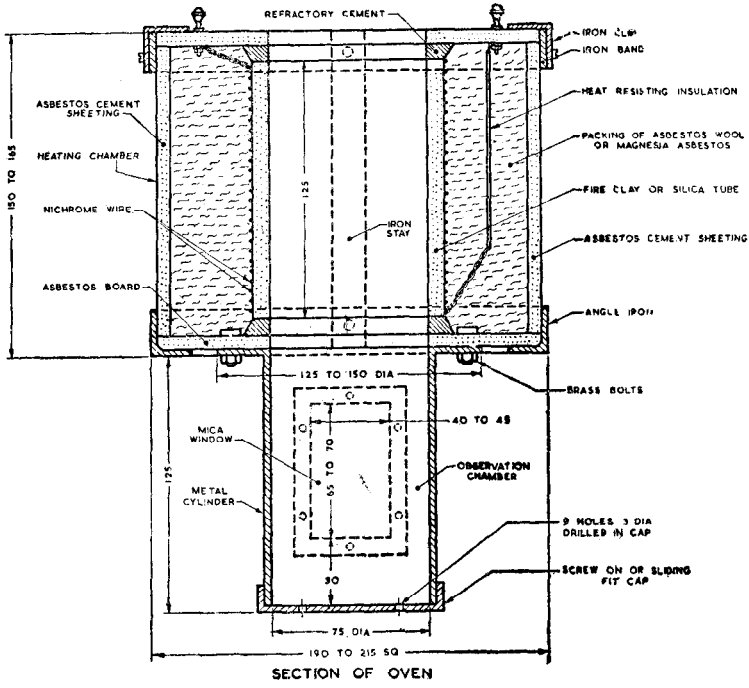
D-2. APPARATUS

D-2.1 The specimen shall be tested in the heating tube of an apparatus of the general type shown in Fig. 7 the pilot flame being located 20 mm above the upper end of the specimen.

D-2.2 A support for the specimen shall be provided in the heating tube, and this may suitably consist of a light stirrup of nichrome wire, supported by a length of nichrome wire passing over the pilot flame tube. The support shall be such that the specimen is fixed centrally in the heating tube with its largest dimension vertical.



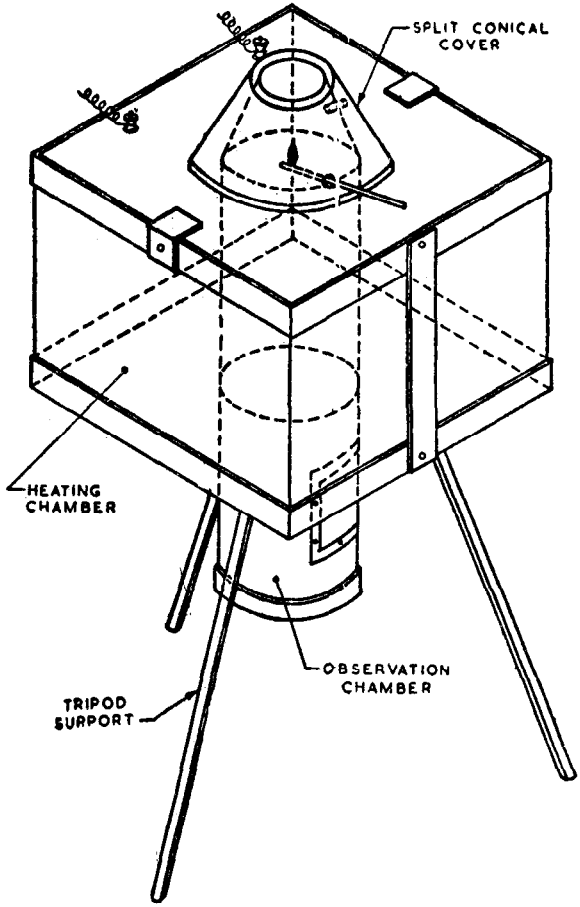
7A DETAILS OF CONICAL COVER
(TO BE OF REFRACTORY MATERIAL)



7B Details of Test Oven

All dimensions in millimetres.

FIG. 7 APPARATUS FOR NON-FLAMMABILITY TEST — *Contd*



7C Sketch of Assembled Apparatus

FIG. 7 APPARATUS FOR NON-FLAMMABILITY TEST

D-2.3 The apparatus shall be heated by passing a suitably regulated electric current through a nichrome resistance wire surrounding the heating tube.

D-2.4 Measurement of Temperature of Tube — The temperature of the tube shall be taken as shown by a thermocouple situated at the level of the centre of the specimen and equidistant from the inner surface of the heating tube and the specimen. The wires of which the thermocouple is made shall be not larger than 1·25 mm and not smaller than 0·45 mm and shall be bare for a length of 25 mm from the junction.

D-3. TEST FOR NON-FLAMMABILITY

D-3.1 The temperature of the tube shall be raised to 300°C and the specimen shall then be re-adjusted to 300°C within a period of three minutes, and this temperature shall be maintained until a period of five minutes has elapsed from the time of insertion of the specimen. During this period of five minutes, a conical cover at the top shall limit the opening to approximately 6·5 cm^2 while the air intake orifice at the bottom shall be open approximately 0·65 cm^2. At the end of the period of five minutes, the specimen shall be removed from the tube. The material shall not be deemed non-flammable if at any time during the test the specimen flames or gives off flammable vapours in sufficient quantities to ignite at the pilot flame.

APPENDIX E

(*Clause* 9.15)

HEAT RESISTANCE TEST

E-1. The samples shall be kept for one hour in an oven, in which a constant temperature of 100 ± 5°C is maintained. At the end of this period, the samples shall satisfactorily pass the following tests:

a) Visual examination,

b) Test on screw terminal, and

c) Test for accidental contact of live parts.

E-2. After the heat treatment, the external housing or other enclosures made of insulating material other than ceramic material shall be subjected to the ball pressure test by means of the apparatus shown in Fig. 8. The test shall be carried out as given in **E-2.1** and **E-2.2.**

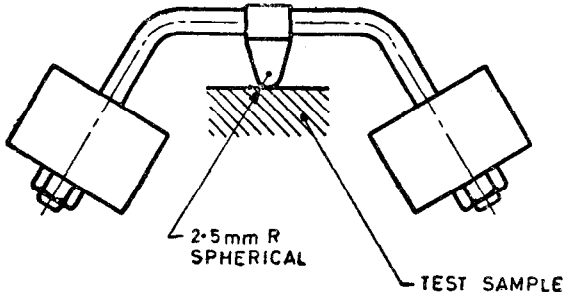


FIG. 8 BALL PRESSURE APPARATUS

E-2.1 The part to be tested shall be placed in an oven at a temperature of 125 ± 5°C. A steel ball of 5 mm diameter shall be kept pressed under the weight of 2 kg on the surface to be tested for one hour.

E-2.2 After one hour the diameter of the impression made by the ball shall be not more than 2 mm.

(*Continued from page* 2)

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Headquarters:
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