IS 2215 (2006): Starters for Fluorescent Lamps [ETD 23: Electric Lamps and their Auxiliaries]

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(तीसरा पुनरीक्षण)

Indian Standard

STARTERS FOR FLUORESCENT LAMPS

(Third Revision)

ICS 29.140.30

BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 7

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electric Lamps and Their Auxiliaries Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1963 and was subsequently revised in 1968 and 1983. Inadvertently, the 1983 version was published as third revision whereas it should have been second revision. This revision has been undertaken to take into consideration the developments that have taken place since the last revision and also to align with International practices.

The performance of fluorescent lamps is dependent on the characteristics of the auxiliaries with which the lamps are used. Pre-heat type fluorescent lamps starter is one such auxiliary used to pre-heat the cathode filaments of the fluorescent lamps and for starting the discharge in conjunction with ballast.

Glow starters, the most common type of starters because of their simplicity, low cost, versatility and robustness, basically consist of two electrodes (at least one of which is a bimetallic strip) sealed into a small glass bulb containing an inert gas. The closing and opening of the starter contacts are controlled automatically by means of glow discharge in the gas filling. The glow starter is mounted in a small cylindrical box fitted with two contacts and containing also a small capacitor to suppress any radio interference caused by the lamp.

This standard describes the general requirements with which glow starters shall comply in order to ensure safety and also the requirements for performance. Only glow starters used with pre-heat type fluorescent lamps of 4 to 65 W specified in IS 2418 (Part 2) : 1977 'Specification for tubular fluorescent lamps for general lighting service: Part 2 Standard lamp data sheets (*first revision*)', are presently covered in the standard.

This standard is based on IEC Pub 60155 (1993) with Amendment 1 (1993) 'Glow starters for fluorescent lamps' issued by the International Electrotechnical Commission (IEC) except for the following deviations:

a) Starter ratings up to 65 W have been covered; and
b) Schedule of tests and sampling plan for acceptance tests have been incorporated.

Following changes have been incorporated in the standard:

a) Glow starter with operating time limitation have been covered;
b) The ambient temperature has been specified as 25 ± 5°C;
c) The additional requirements of glow starters for use in Class II luminaries have been included;
d) Glow starters of 4 W to 65 W have been covered;
e) Additional marking requirements have been included; and
f) Glow wire test for resistance to fire added.

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

STARTERS FOR FLUORESCENT LAMPS

(Third Revision)

1 SCOPE

1.1 This standard covers the requirements and methods of test for two-pin canister type glow starters for pre-heat type fluorescent lamps of rating 4 W to 65 W, hereafter called starter.

1.2 Starters covered by this standard are intended for operation on ac only.

NOTES

1 Starters of other types, such as thermal starters, magnetic starters or glow starters with operating time limitations are not covered by this standard.

2 Starters are generally designed to operate with a range of lamps, depending on supply voltage, single lamp or series pair operation, maximum lamp voltage and lamp starting requirements.

The additional requirements with which glow starters for use in Class II luminaries shall comply are specified in Annex A.

2 REFERENCES

The following standards are necessary adjunct to this standard:

IS No.	*Title*
1534 (Part 1) : 1978	Ballast for tubular fluorescent lamps: Part 1 For switched start circuits (*second revision*)
2418 (Part 1) : 1977	Tubular fluorescent lamps: Requirements and tests (*first revision*)
(Part 2) : 1977	Standard lamp data sheets (*first revision*)
3324 : 1982	Holders for starters for tubular fluorescent lamps (*first revision*)
4905 : 1968	Methods for random sampling
8460 : 1977	Wrapping tissue paper
10322 (Part 1) : 1982	Luminaries: Part 1 General requirements
11000 (Part 2/ Sec 1) : 1984	Fire hazard testing: Part 2 Test methods, Section 1 Glow-wire test and guidance

3 TERMINOLOGY

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

3.1 Starter — A device, other than a main switch, which closes or opens the pre-heating circuit of a fluorescent lamp for the purpose of starting the lamp.

3.2 Glow Starter — A starter which depends for its operation on a glow discharge in a gaseous atmosphere.

3.3 Non-reclosure Voltage — A reduced voltage at which the starter contacts must not reclose after operation at the test voltage specified for testing the speed of operation.

3.4 Deactivated Lamp — A lamp in which one or both filaments are deprived of emitting material, but neither of which is broken.

3.5 Glow-Starters with Operating Time Limitation — A glow-starter which prevents prolonged attempts to start lamps which refuse to start, for example, lamps with deactivated electrodes.

The following types can be distinguished:

a) Starters which are non-resettable (one shot);

b) Starters with a manual reset; and

c) Starters with an automatic reset, by actuating the main switch or other intended actions.

3.6 Type Tests — Tests carried out to prove conformity with this specification. These are intended to prove the general quality and design of a given type of starter.

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

3.8 Routine Tests — Tests carried out on each starter to check requirements, which are likely to vary during production.

4 GENERAL REQUIREMENTS

4.1 Starters shall be so designed and constructed that in normal use their operation is without danger to the user or surroundings. In general, compliance is checked by carrying out all the tests specified.

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

4.3 Enclosures for interchangeable starters shall ensure protection against electric shocks. Protection may be ensured either by an insulating enclosure or by an appropriate non-metallic lining or other means, which prevent accidental contact between live parts and the enclosure.

4.4 Electrical connections shall be so designed that the contact pressure is not transmitted through insulating material other than ceramic material. Compliance is checked by inspection.

This requirement does not apply to contacts between detachable parts, such as starters and their holders, for which adequate spring action is required.

5 GENERAL REQUIREMENTS FOR TESTS

5.1 Requirements for Test

5.1.1 Unless specified otherwise in the individual clauses the ambient temperature shall be between 25 ± 5°C.

5.1.2 The supply voltage shall be steady and free from sudden changes. The wave-shape shall be substantially of sine-wave form. The total harmonic content of the supply voltage shall not exceed 3.0 percent of the fundamental. The impedance of the power source shall be small in relation to that of the ballast.

5.1.3 The frequency of the supply voltage shall be 50 Hz with tolerance of ± 0.5 percent.

5.1.4 The electrical tests shall be carried out after keeping the starters in complete darkness for at least 15 h immediately prior to the tests (Enclosure in a light-excluding canister or opaque container shall be considered as compliance with this requirement).

5.1.5 During the starting tests also the starters shall be kept in complete darkness (Enclosure in a light-excluding canister or opaque container shall be deemed to comply with this requirement).

5.1.6 The tests shall be carried out in the order of clauses.

5.2 Requirements of Auxiliaries for Testing

5.2.1 The fluorescent lamps used shall be the principal type for which the starter is designed, conforming to IS 2418 (Part 1). The lamps shall be aged for a minimum period of 100 h before use.

5.2.2 The lamps selected shall have their operating voltage within 2.0 percent of rated operating voltage as given in IS 2418 (Part 2). Lamps showing swirling or other abnormal operation or condition should be avoided.

5.2.3 Lamps selected shall be such that they start within 10 s with the help of a manual starter at 27 ± 2°C.

5.2.4 Replacement at reasonable intervals is recommended.

5.2.5 The ballasts used shall be of suitable type conforming to IS 1534 (Part 1) and appropriate to the wattage of the lamp with which the starter is designed to operate.

5.2.6 A deactivated lamp shall be used for the test specified in **10**.

6 MARKING

6.1 Starters shall be provided with durable and legible marking as follows:

a) Manufacturer's or responsible vendors' name or trade-mark;
b) Type or catalogue reference;
c) Lamp(s) for which the starter is intended;
d) Temperature range for which the starter is intended to be used, if applicable; and
e) Country of manufacture.

If this requirement is marked in the form of a lamp wattage range, the marking shall:

a) either include all the standardized wattages within that range given in IS 2418 (Part 2); or
b) indicate departure from that range either on the packaging material or in catalogues published by the manufacturers.

6.2 Other useful indications, for example the circuit for which the starter is intended and in some cases, the rated voltage of the starter, shall either be marked on the starter or be referred to in manufacturer's publications.

If applicable, the information shall be given that the starter is equipped with means of operating time limitation.

NOTE — It is assumed that a marked wattage range includes all ratings within that range unless otherwise indicated in the manufacturer's literature.

6.3 Marking shall be indelible and easily legible. It shall comply with the requirements of **7.11**.

6.4 BIS Certification Marking

The starter may also be marked with the Standard Mark.

6.4.1 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. Details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers and producers, may be obtained from the Bureau of Indian Standards.

7 REQUIREMENTS AND TESTS FOR SAFETY

7.1 Type Test Quantity

The type test quantity shall consist of five starters to be submitted to the tests specified in **7.3** to **7.11** and **7.12.1** and ten starter capacitors to be submitted to the test specified in **7.12.2** and **7.12.3**. In addition, for starters with operating time limitations, five starters shall be submitted to the test specified in **7.13**.

7.2 Conditions of Acceptance

The type shall be considered as satisfying the requirements of this clause, if all five starters comply with the tests specified in **7.3** to **7.11** and in **7.12.1** and if all 10 capacitors comply with the tests specified in **7.12.2** and **7.12.3**.

If any failures occur during a test, that test and the preceding ones, which may have influenced the results of that test, are repeated on a further five starters, all of which shall then comply with the repeated tests.

All 10 starter capacitors submitted to the tests specified in **7.12.2** and **7.12.3** shall pass the tests. If any failure occurs during these tests, they shall be repeated on a further 10 starter capacitors, all of which shall comply with the repeated tests.

7.3 Protection Against Accidental Electric Shocks

Enclosures for interchangeable starters shall ensure protection against electric shocks. Protection may be ensured either by an insulating enclosure, by an appropriate non-metallic lining, or other means which prevent accidental contact between live parts and the enclosure. Compliance is checked by inspection.

7.4 Insulation Resistance Under Humidity Conditions

Immediately after a humidity treatment of 24 h × 2 in an atmosphere of 91 percent to 95 percent relative humidity and an ambient temperature between 25°C and 35°C maintained within limits of ± 1°C, the insulation resistance between live parts and the metal canister of the starter shall be not less than 2 M Ω measured after 1 min at 500 V dc. In the case of canisters of insulating material, they shall be covered by tinfoil and the preceding requirements shall be satisfied, the test being carried out between the foil and live parts.

Before starting the humidity treatment, the starters shall be kept in an ambient temperature which does not differ from the temperature within the humidity test enclosure by more than $^{+4}_{0}$°C, for at least 4 h.

7.5 Dielectric Strength

Immediately after the insulation resistance test, the starter shall be subjected to and satisfactorily withstand for 1 min without breakdown a sinusoidal ac of 1 500 V rms applied between the same parts as those referred to in **7.4**.

7.6 Dimensions

7.6.1 The dimensions shall comply with the requirements of Fig. 1. Compliance shall be checked by the gauges of Fig. 2, 3 and 4.

7.6.2 The external creepage distance and clearance shall be not less than 3 mm between live parts of different polarity, or between live parts and accessible metal parts.

The internal creepage distance between live parts and accessible metal parts shall be not less than 2 mm.

7.7 Torsion Test

The starter shall withstand a torque of 0.6 Nm about the axis and applied at the top of the canister by holding the pins in a fixed support. The torque shall not be applied suddenly but increased gradually from zero to the value specified.

7.8 Mechanical Strength

The starter shall withstand without damage affecting safety, 20 falls of 500 mm onto a 3 mm thick steel plate in a tumbling barrel turning at 5 rev/min (that is 10 falls per minute). Suitable equipment for this test is shown in Fig. 5.

7.9 Connections

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

Compliance is checked by inspection.

This requirement does not apply to contacts between detachable parts, such as starters and their holders, for which adequate spring action is required.

7.10 Resistance to Heat and Fire

7.10.1 Enclosures and other external parts of insulating material shall be sufficiently resistant to heat.

Compliance is checked by the following tests:

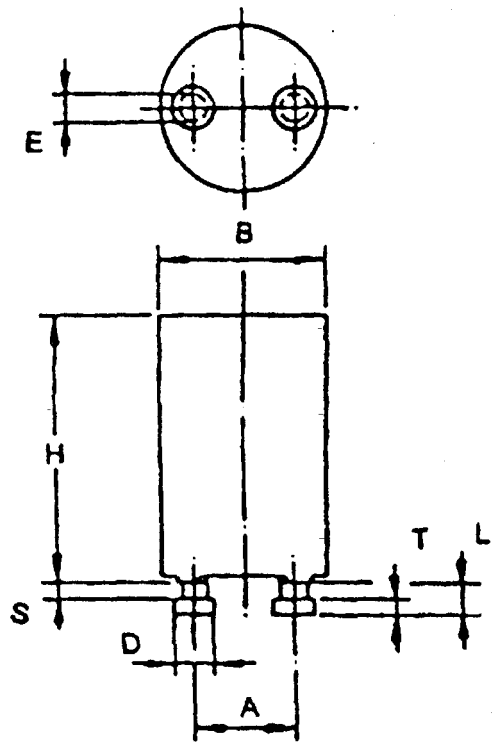
Five samples are tested in a heating cabinet at a temperature of 125°C during 168 h.

During the test, the samples shall not undergo any change impairing their safety, especially in the following respects:

a) Reduction of the protection against electric shock;

b) Loosening of electrical contacts; and

c) Cracks, swelling or shrinking.



All dimensions in millimetres.

NOTE — The drawing is intended only to indicate the dimensions to be checked.

Dimension	*Minimum*	*Maximum*
A	12.5	12.9
B	—	21.5
D	4.7	5.0
E	2.8	3.2
H	33.0	36.0
L	—	4.3
S	1.7	—
T	1.9	2.2
The starters are checked with gauges shown in Fig. 2, 3 and 4.		

FIG. 1 DIMENSIONS OF STARTERS

At the end of the test, the dimensions shall comply with the requirements of **7.6.1**.

7.10.2 Enclosures and other external parts of insulating material shall be subjected to a ball-pressure test by means of the apparatus shown in Fig. 6.

The surface of the part under test is placed in the horizontal position and a steel ball of 5 mm diameter is pressed against this surface by a force of 20 N. If the surface under test bends, the part where the ball presses should be supported.

The test shall be made in a heating cabinet at a temperature of 125 ± 5°C.

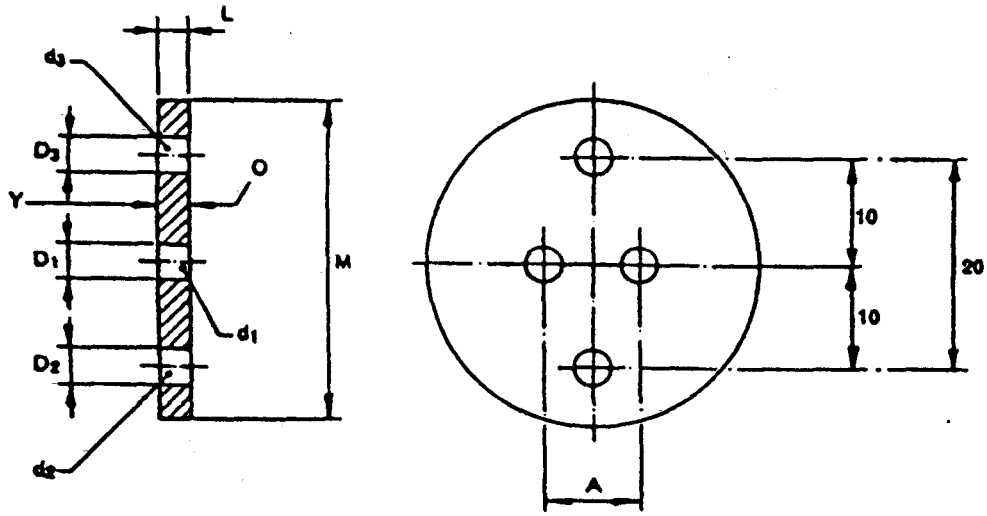
After 1 h the ball shall be removed and the diameter of the impression measured. This diameter shall not exceed 2 mm.

The test shall not be made on parts of ceramic, urea or alkyd plastics. For enclosures made from these materials, a test is under consideration.

7.10.3 Enclosures and other external parts of insulating material shall be resistant to abnormal heat and fire.

Compliance is checked by the following test.

Parts are subjected to a test using a nickel-chromium



All dimensions in millimetres.

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

Reference	*Dimension*	*Tolerance*
A	12.70	± 0.005
D_1	5.20	+ 0.01
D_2	5.00	+ 0.01
D_3	4.70	− 0.01
L	4.30	+ 0.02
M	35	Approximately

Purpose: For the control of dimensions D_{Min}, and D_{Max} and the combined pin diameter and displacement of pins of Fig. 1.

Testing: The pins shall enter the gauge hole d_1, at surface *O* and, when fully inserted, the surface of starters and gauge shall contact. In this position, the ends of the pins shall not project beyond surface *Y*. The individual pin shall enter the hole d_2, but it shall not enter the hole d_3.

FIG. 2 "GO" AND "NOT GO" GAUGE FOR STARTERS

glow-wire heated to 650°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 in to 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 30s 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 ± 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).

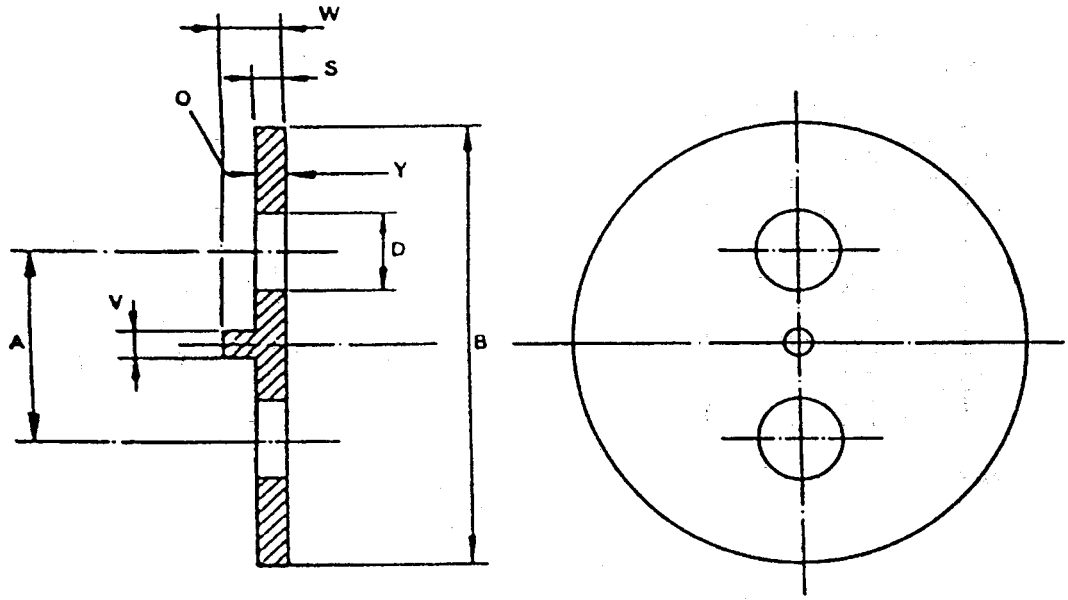
Precautions shall be taken to safeguard the health of personnel conducting tests against:

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

7.11 Quality of Marking

Compliance with the requirements shall be checked by inspection after rubbing the marking lightly for 15 s with a piece of cloth soaked with water.

The test shall be repeated using a further piece of cloth soaked with petroleum spirit.



All dimensions in millimetres.

The drawing is intended only to illustrate the essential dimensions of the gauge. The gauge does not apply to starters for Class II fluorescent lamp luminaries. A gauge for these is given in Fig. A-2.

Reference	*Dimension*	*Tolerance*
A	12.70	± 0.01
B	30	± 0.5
D	5.20	+ 0.05
S	1.60	− 0.05
V	2.20	+ 0.01
W	3.60	+ 0.01

Purpose: For checking that the starter cannot be inserted in a special holder provided with a pin having a diameter *V*.

Testing: The starter shall enter the gauge from the side *O*, but the heads of the pins shall not pass so far that they can be turned beyond surface *Y*.

FIG. 3 "NOT GO" GAUGE FOR STARTERS

7.12 Radio Interference Suppression Capacitors

7.12.1 The starter shall incorporate a radio interference suppression capacitor value between 0.005 µF and 0.02 µF, unless otherwise indicated on the appropriate lamp data sheet of IS 2418 (Part 1).

Compliance shall be checked by inspection.

7.12.2 The capacitor shall be resistant to moisture. Compliance shall be checked by the following test.

Before the humidity treatment, the capacitors shall be kept at an ambient temperature which does not differ from the temperature within the humidity test enclosure by more than $^{+4}_{0}$°C, for at least 4 h.

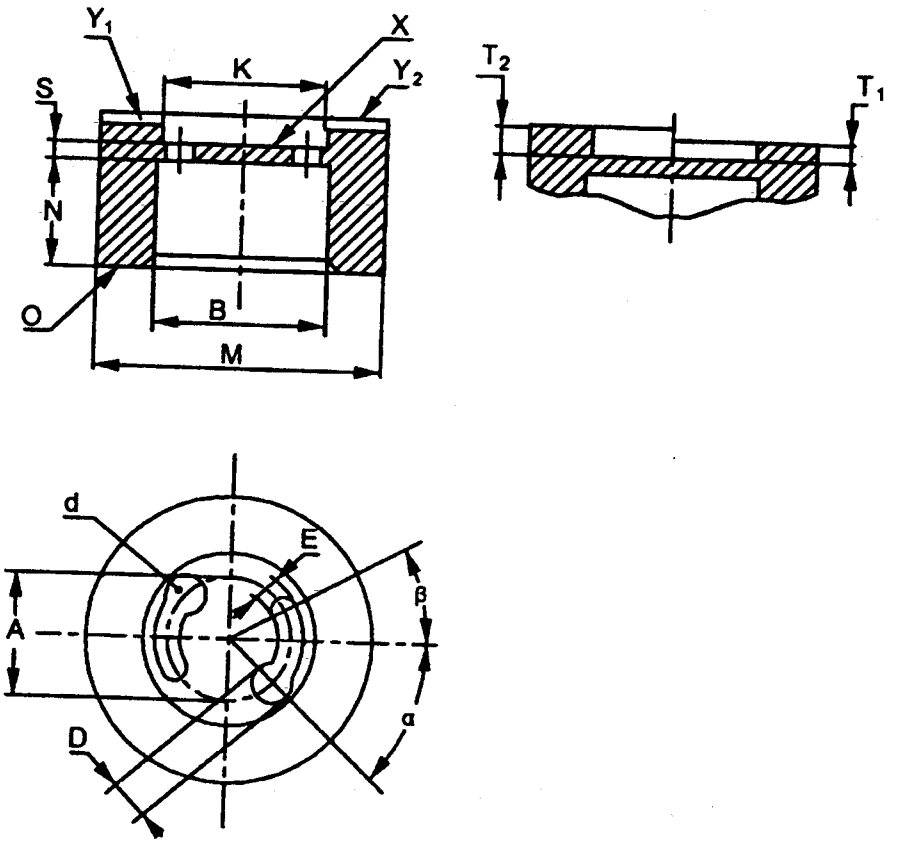
Immediately after the humidity treatment of 24 h × 2 in an atmosphere of 91 to 95 percent relative humidity and an ambient temperature between 25°C and 35°C maintained within limits of ± 1°C, the capacitor shall be subjected to and satisfactorily withstand for 1 min without breakdown a dc voltage of 2 000 V.

The test voltage shall be applied across the terminations of the capacitor, and initially shall not be more than half the prescribed voltage. It shall then be raised gradually to the specified full value.

7.12.3 The capacitors shall be resistant to flame and ignition.

Compliance shall be checked by the following test.

The capacitors are each subjected to a gradually increasing ac voltage until breakdown occurs. The voltage source used to this effect should have a short-circuit power of approximately 1 kVA.



All dimensions in millimetres.

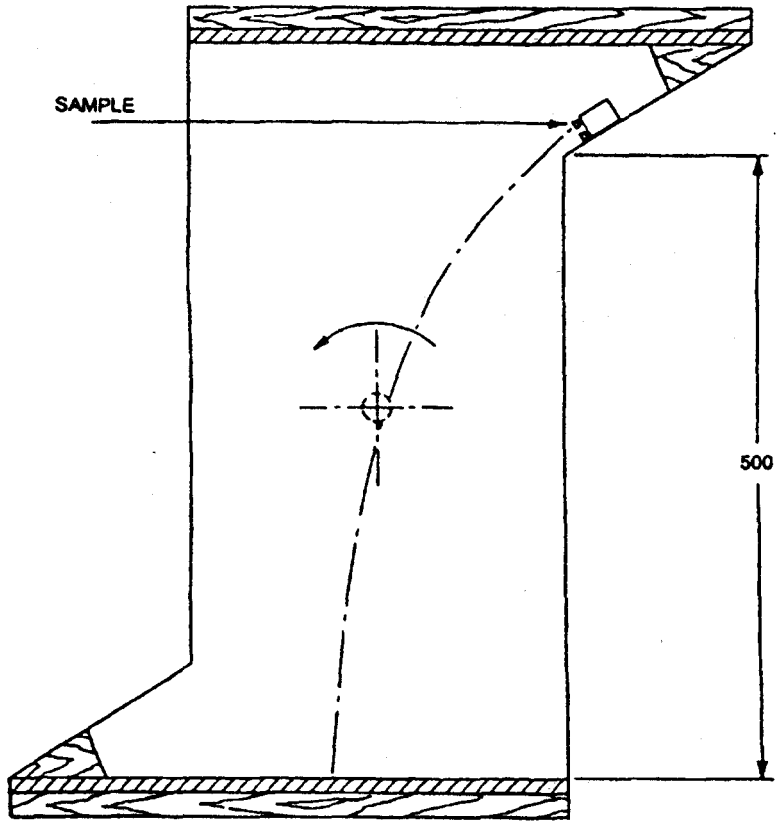
The drawing is intended only to illustrate the essential dimensions of the gauge.

Reference	*Dimension*	*Tolerance*
A	12.70	± 0.005
B	21.50	+ 0.01
D	5.20	+ 0.01
E	3.40	+ 0.01
K	19.0	+ 0.2
M	35	Approximately
N	13	Approximately
S	1.70	– 0.01
T_1	1.90	– 0.01
T_2	2.20	+ 0.01
α	45°	Approximately
β	15°	Approximately

Purpose: For the control of dimensions B_{Max}, S_{Min}, T_{Min}, T_{Max}, and the position of the pins with respect to the dimensions *A*, *D* and *E* of Fig. 1.

Testing: The starter shall enter the gauge at surface *O* until the heads of the pins have passed through the holes *d*. The starter is then turned through approximately 45° and is positioned so that the heads of the pins are in close contact with surface *X*. In this position, the extremities on the heads of the pins shall not be below surface Y_1 nor shall they project beyond surface Y_2.

FIG. 4 "GO" GAUGE FOR STARTERS



All dimensions in millimetres.

FIG. 5 TUMBLING BARREL

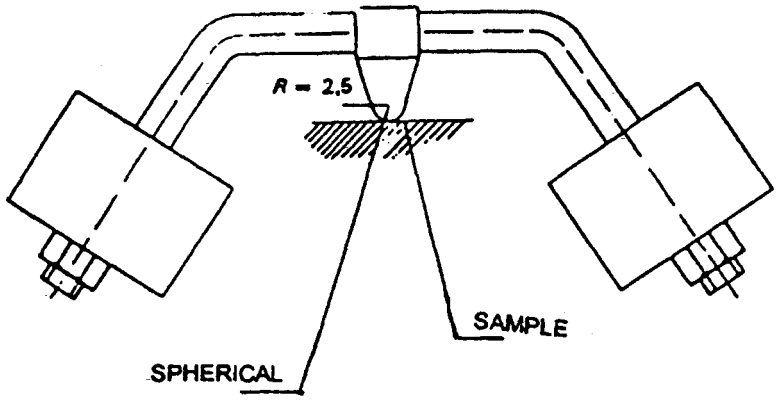


FIG. 6 BALL PRESSURE TEST APPARATUS

Thereafter, each capacitor shall be completely wrapped with tissue paper as specified in IS 8460 and shall be connected in series with 40W inductive ballast complying with the requirements of Annex B and operated for 5 min at the rated voltage of the ballast.

During this test, the capacitor shall not inflame the tissue paper.

7.13 Heating of Starters with Operating Time Limitation

The enclosure of starters with operating time limitation shall not deform during normal abnormal operation, so that safety is not impaired.

Compliance is checked by the following test.

Starters are connected as in normal use and associated with a deactivated lamp of the highest wattage rating marked on the starter and corresponding inductive ballast.

The ballast shall comply with the requirements of Annex B. The test voltage shall be equal to 110 percent of the rated voltage of the ballast.

Starters are tested at the highest value of the marked temperature. Only the starter is subjected to this temperature. The ballast and the lamp shall remain at room temperature.

The duration of the test shall be 168 h.

NOTE — Starters for which the operating time limitation is performed by means of cut-out which fully interrupts the starting current need not be tested according to this sub-clause.

8 STARTING TEST

8.1 Starting Test Quantity

The starting test quantity shall consist of five new starters, which have not been subjected to the tests specified in **6** and **7**.

8.2 Conditions of Acceptance

The type shall be considered as satisfying the requirements of this clause, if all five starters comply with the tests specified in **8.4** to **8.7**. If one failure occurs, a further five starters shall be selected and tested and all these shall comply.

If more than one failure occurs in the first sample, the starters are deemed not to satisfy the requirements of this clause.

8.3 Conditions of Test

8.3.1 For the duration of the test, the starter shall be in complete darkness and shall have been kept in complete darkness, for at least 15 h immediately prior to the test.

This condition will be satisfied, if the starter is enclosed in an opaque container.

8.3.2 The starter shall be tested in the circuit shown in Fig. 7.

8.3.3 The ballast used shall meet the requirements of IS 1534 (Part 1). It shall have a rated voltage equal to the mains voltage or falling within the mains voltage range for which the starter is designed. It shall have a rated wattage suitable for the main type of lamp for which the starter is designed. The ballast used shall be of an inductive type.

NOTE — The ballast used for testing shall be inductive type as capacitor type ballast is not manufactured and used by the user (consumer).

In case of doubt, a choice shall be made in mutual agreement between testing authority and manufacturer.

NOTE — Generally, the rated voltage shall be the same as the voltage rating of the ballast prescribed in IS 2418 (Part1) for the lamp starting test.

8.3.4 The lamp used shall meet the requirements of IS 2418 (Part 1) for switch-starter operated lamps and shall have the same rated wattage as the ballast used.

8.3.5 The total harmonic content of the supply voltage shall not exceed 3 percent. The harmonic content being defined as the root-mean-square (r.m.s) summation of the individual harmonic components, using the fundamental as 100 percent.

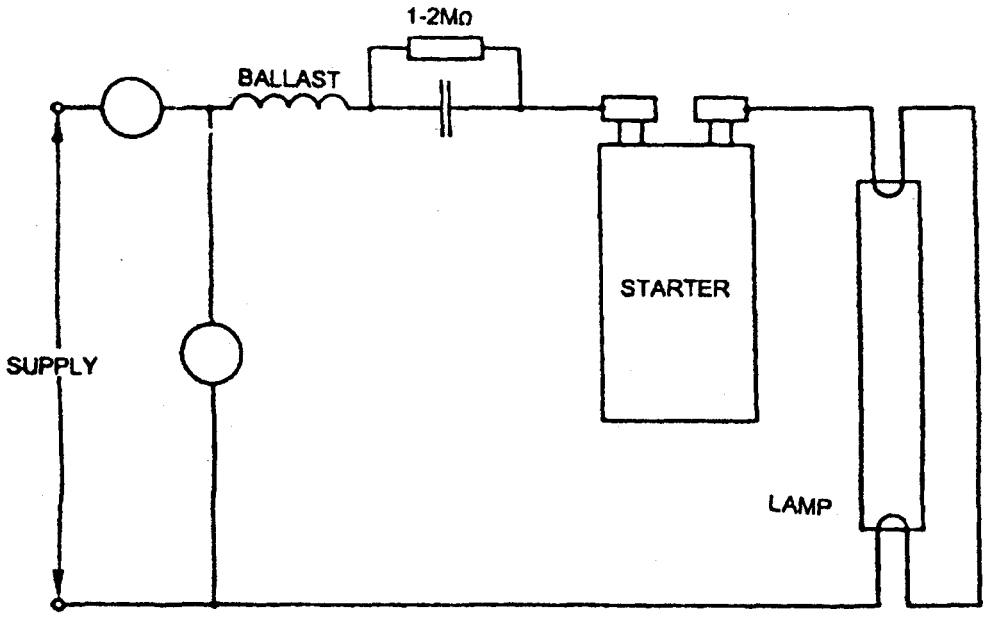


FIG. 7 CIRCUIT FOR STARTING TEST

Care shall be taken that this applies under all conditions that occur during the measurement.

NOTE — This implies that the source of supply shall have sufficient power, and that the supply circuit has sufficiently low impedance compared with the ballast impedance.

8.4 Speed of Operation

With the exception of 20 W lamps as specified in IS 2418 (Part 2) for which the voltage shall be 103.5 V, a voltage equal to the test voltage of the lamp starting test for the relevant lamp specified in IS 2418 (Part 2) shall be applied to the circuit for 25 s.

During this time, the contacts shall open not less than seven times.

8.5 Closed Time

During the period of 25 s referred to in **8.4**, the starter contacts shall be closed for a minimum total period of 10 s.

NOTE — Details of the time-measuring device are not included in Fig. 7.

8.6 Non-reclosure Voltage

The voltage shall quickly and continuously be reduced from the value used in **8.4** to the non-reclosure voltage as given in col 4 of Table 1, without breaking the supply circuit. In case the starter is designed for a range of lamps, care should be taken that the highest maximum voltage value of all lamps within that range is taken.

The switch contacts shall not reclose within 1 min, at the reduced voltage.

8.7 Pulse Voltage

The circuit for measuring pulse voltage shall be as shown in Fig. 8, in combination with the circuit of Fig. 7. The same voltage as specified in **8.4** shall be applied to the test circuits for 25 s. On at least one occasion during this period, the highest pulse voltage (indicated either of the two voltmeters) shall be not less than the minimum peak voltage as given in col 5 of Table 1.

In case the starter is designed for a range of lamps, care should be taken that the highest maximum voltage value of all lamps within that range is taken.

NOTE — As an alternative to the electrostatic voltmeter prescribed in Fig. 8, a memory oscilloscope may be used in the circuit together with a high voltage probe having the following properties:

a) Input resistance.....≥ 100 Ω
b) Input capacitance.....≤ 15 *p*F
c) Cut-off frequency.....≥ 1 MHz

In case of dispute, the measurement with the electrostatic voltmeter is the reference method.

9 ENDURANCE TEST

9.1 Test Quantity

The test quantity shall consist of five starters which have passed the starting tests, but which have not been subjected to any additional tests.

9.2 Conditions of Acceptance

The type shall be considered as satisfying the requirements of this clause, if all the five starters pass the tests specified in **8.4** to **8.7** inclusive, after having been subjected to the endurance test specified in **9.3**.

In the event of one starter failing to comply, another five starters shall be tested, all of which shall comply. If more than one failure occurs, the starters are deemed not to satisfy the requirements of this clause.

9.3 Conditions of Test

Starters for lamp ratings up to and including 65 W shall be tested in the circuit shown in Fig. 9.

A lamp of the highest rating for which the starter is intended, and a corresponding ballast of the inductive type shall be used.

The ballast shall comply with the requirements of Annex B.

The test voltage shall be equal to the rated voltage of the ballast.

In the event of a lamp failing during this test, arrangements shall be made for its immediate replacement.

The test voltage shall be applied to the circuit for 6 000 test cycles, each of 1 min. During each cycle, the voltage shall be applied for 20 s to 30 s.

10 DEACTIVATED LAMP TEST

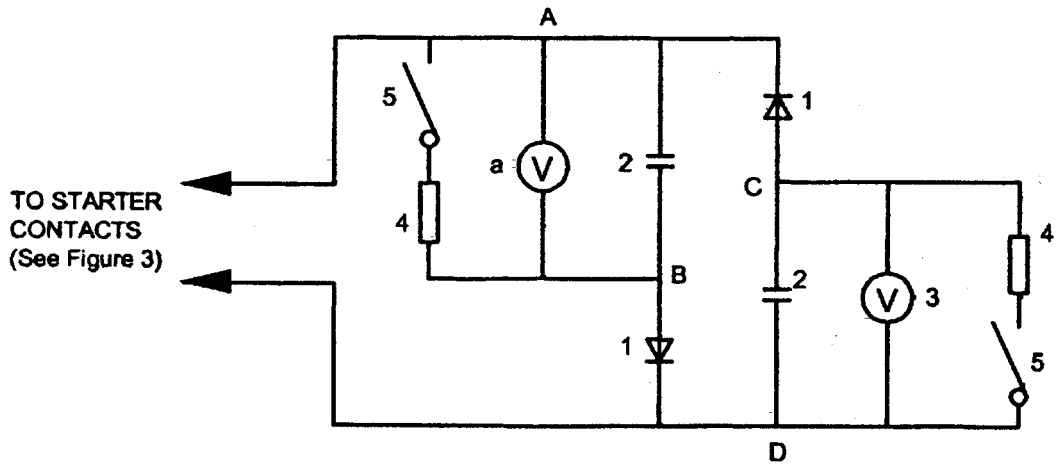
10.1 Test Quantity

The test quantity shall consist of five starters which have passed the starting tests, but which have not been subjected to any additional tests.

10.2 Conditions of Acceptance of Starters without Operating Time Limitation

The type shall be considered as satisfying the requirements of this clause, if all five starters pass the tests specified in **8.4** to **8.7** inclusive, after having been subjected to the deactivated lamp test specified in **10.3**.

In the event of one starter failing to comply, another five starters shall be tested, all of which shall comply. If more than one failure occurs, the starters are deemed not to satisfy the requirements of this clause.



The leakage resistance between *A-B* and *C-D* shall be not less than 10^{11} Ω.

1. HV diode (HV)

Blocking voltage	U_{RM}	≥ 6 kV
Rated current (average)	I_{FAVM}	≥ 1.5 mA
Periodic current (peak)	I_{RFM}	≥ 0.1 A
Forward voltage	V_F	≤ 20 V

NOTE — Suitable parts are, HV diodes type BYX90G.

2. HV capacitor

Capacitance	C	= 4 000 pF
Rated voltage	U	≥ 6.3 kV
Phase-angle (at 10 kHz)	tan δ	= 20.10^{-3}

3. HV measuring instrument electrostatic voltmeter

Capacitance at full deflection	C	< 15 pF
Breakdown voltage	U	> 10 kV
Precision	Class 1 or better	

4. Discharge resistance — R = 1 MΩ
5. Short-circuit device for discharging HV capacitor

FIG. 8 CIRCUIT FOR MEASUREMENT FOR PULSE VOLTAGE

Table 1 Non-reclosure and Minimum Peak Voltage

(*Clauses* 8.6 *and* 8.7)

Sl No.	Nominal Rating of Lamp	Test Voltage	Non-reclosure Voltage	Minimum Peak Voltage
	W	V	V	V
(1)	(2)	(3)	(4)	(5)
i)	4	90	70	250
ii)	6	90	70	250
iii)	8	95	70	250
iv)	13	95	130	400
v)	18	95	70	800
vi)	20	95	70	250
vii)	36	180	140	800
viii)	40	180	130	400
ix)	58	180	140	400
x)	65	180	140	400
xi)	80	180	130	400

10.3 Conditions of Test

Starters for lamp ratings upto and including 65 W shall be tested in the circuit shown in Fig. 9. The lamps used shall be deactivated.

The duration of the test is 3 h.

For practical reasons, a more stringent test without a lamp in the circuit may be used. In case of doubt, the lamp test according to Fig. 9 shall, however, be decisive.

A lamp of the highest rating for which the starter is intended and appropriate inductive ballast shall be used.

The ballast shall comply with the requirements of Annex B. The test voltage shall be equal to the rated voltage of the ballast.

In the event of a lamp failing during this test, arrangements shall be made for its immediate replacement.

10.4 Conditions of Acceptance for Starters with Operating Limitation

The type shall be considered as satisfying the requirements of this clause, if five starters pass the test specified in **10.5**. After this test, resettable starters shall pass the tests specified in **8.4** to **8.7** inclusive.

In the event of one starter failing to comply, another five starters shall be tested, all of which shall comply. If more than one failure occurs, the starters are deemed not to satisfy the requirements of this sub-clause.

10.5 Operating Time Limitation Test

Within 5 min after switching-on of the supply voltage, the means for preventing to start attempts shall become operative. Self-resetting shall not take place.

Compliance is checked by observation of lamp starting attempts, or by other means indicated by the manufacturer.

In this test the starters are connected as in normal use and associated with a deactivated lamp of the lowest wattage rating marked on the starter and corresponding ballast. The ballast shall be of an inductive type.

The ballast shall comply with the requirements of Annex B.

The test voltage shall be the rated voltage of the ballast.

Starters are tested at the lowest value of the marked temperature range. Only the starter is subject to this temperature, the lamp and the ballast shall remain at room temperature.

Starters with a manual reset shall be subjected to 25 test cycles of 5 min 'ON', and minimum 10 min 'OFF'.

Starters with an automatic reset shall be subjected to 500 of the above test cycles.

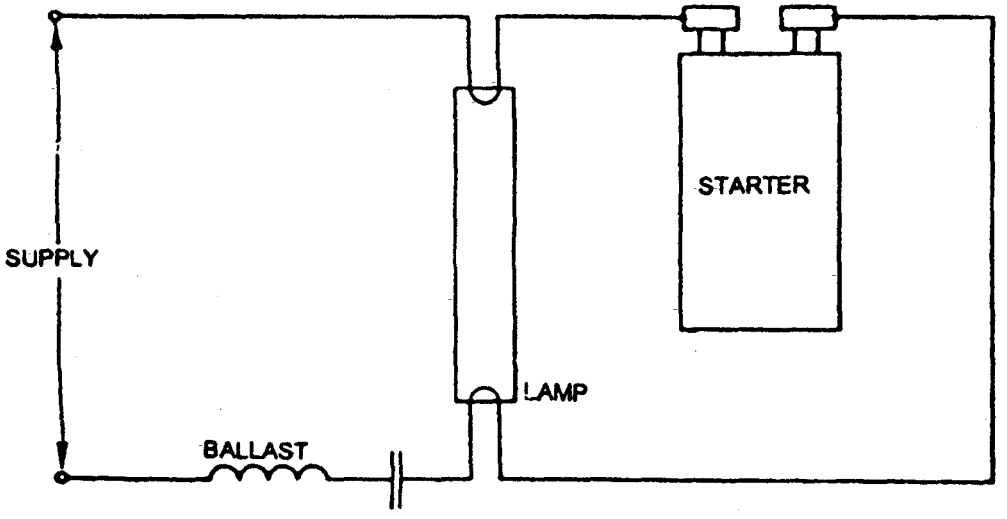
The means for preventing starting attempts shall become operative during every 'ON' period.

NOTE — The ballast used for testing shall be inductive type as capacitor type ballast is not manufactured and used by the user (consumer).

11 INFORMATION FOR BALLAST DESIGN

11.1 Information for Luminaire Design

The maximum temperature of any part of the starter canister shall not exceed 80°C.



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

FIG. 9 CIRCUITS FOR ENDURANCE TEST-STARTERS FOR LAMP RATINGS UP TO AND INCLUDING 65 W

12 SCHEDULE OF TESTS

12.1 Type Tests

The following shall constitute type tests:

a) Marking (*see* **6** and **7.11**),
b) Protection against electric shock (*see* **7.3**),
c) Insulation resistance under humidity conditions (*see* **7.4**),
d) Dielectric strength test (*see* **7.5**),
e) Dimensional checking (*see* **7.6**),
f) Torsion test (*see* **7.7**),
g) Mechanical strength test (*see* **7.8**),
h) Connections (*see* **7.9**),
j) Resistance to heat and fire (*see* **7.10**),
k) Test for radio suppression capacitors (*see* **7.12**),
m) Test for heating of starters with operating time limitation (*see* **7.13**),
n) Starting test (*see* **8**),
p) Endurance test (*see* **9**), and
q) Deactivated lamp test (*see* **10**).

12.2 Acceptance Tests

The following shall constitute the acceptance tests:

a) Quality of marking (*see* **6** and **7.11**), and
b) Dimensional checking (*see* **7.6**).

12.2.1 Sampling procedure for acceptance purposes are given in Annex C.

12.3 Routine Tests

The following shall constitute the routine tests:

a) Quality of marking (*see* **6** and **7.11**);
b) Dielectric Strength test (*see* **7.5**); and
c) Speed of operation (*see* **8.4**).

ANNEX A

(*Clause* 1.2)

STARTERS FOR CLASS II FLUORESCENT LUMINAIRES

For starters for use in Class II fluorescent lamp luminaries, the clauses and sub-clauses of this standard apply with the following modifications.

1 SCOPE

Replace this clause by the following text:

This Annex A is intended to cover a special type of interchangeable glow starter, used with pre-heat type fluorescent lamps, for application in Class II fluorescent lamp luminaries with accessible starters. Corresponding Indian Standards for the fluorescent lamp luminaries and for starter-holders are IS 10322 (Part 1) and IS 3324.

7.3 Protection Against Accidental Electric Shocks

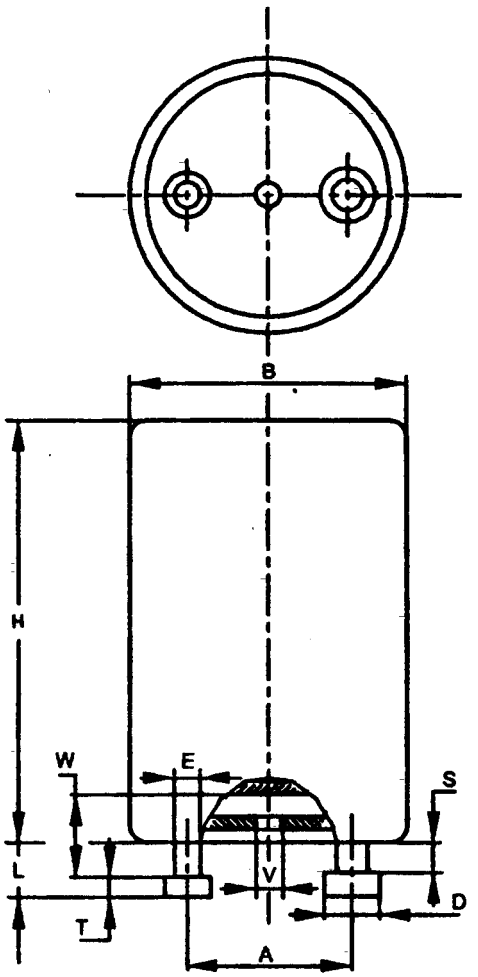
Replace this sub-clause by the following text:

The enclosures of accessible starters shall consist of insulating material. Compliance is checked by inspection.

7.6 Dimensions

Replace sub-clause **7.6.1** by the following text:

7.6.1 The dimensions shall comply with the requirements of Fig. A-1. Compliance shall be checked by the gauges of Fig. A-2 and also Fig. 2 of this standard.



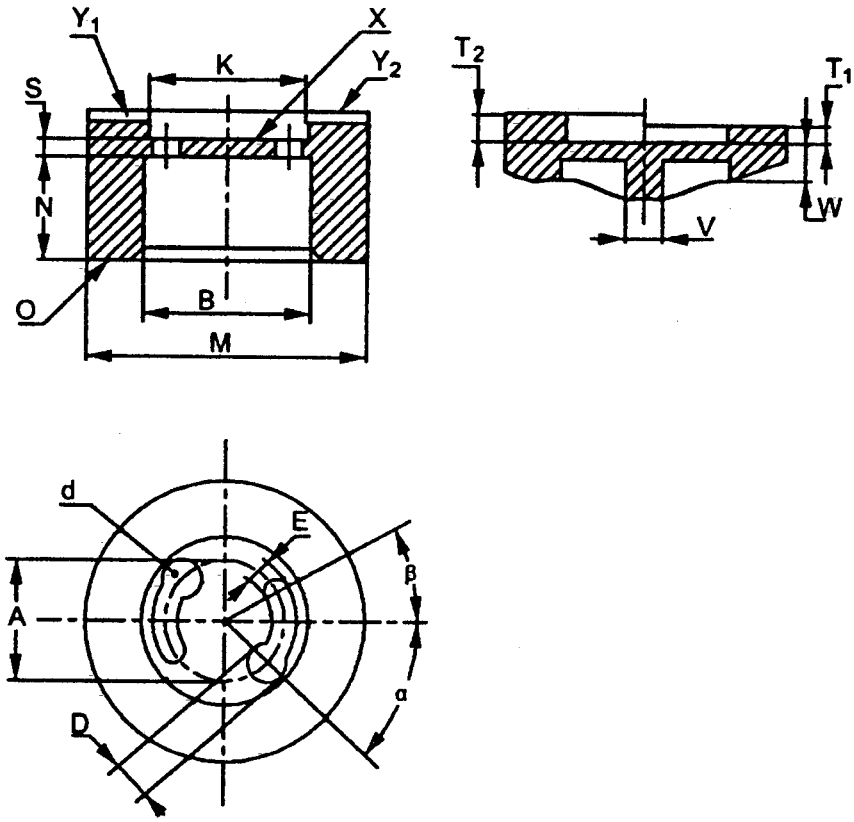
All dimensions in millimetres.

NOTE — The drawing is intended only to indicate the dimensions to be checked.

Dimension	*Minimum*	*Maximum*
A	12.5	12.9
B	—	21.5
D	4.7	5.0
E	2.8	3.2
H	33.0	36.0
L	—	4.3
S	1.7	—
T	1.9	2.2
V	2.7	—
W[1)]	4.2	—

[1)] Distance over which dimension *V* applies.

FIG. A-1 DIMENSIONS OF STARTERS FOR CLASS II FLUORESCENT LAMP LUMINARIES



All dimensions in millimetres.

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

Reference	*Dimension*	*Tolerance*
A	12.70	± 0.005
B	21.50	+ 0.01
D	5.20	+ 0.01
E	3.40	+ 0.01
K	19.0	+ 0.2
M	35	Approximately
N	13	Approximately
S	1.70	– 0.01
T_1	1.90	– 0.01
T_2	2.20	+ 0.01
α	45°	Approximately
β	15°	Approximately
V	2.60	– 0.01
W	4.15	– 0.01

Purpose: For the control of dimensions B_{Max}, S_{Min}, T_{Min}, T_{Max}, and the position of the pins with respect to the dimensions *A*, *D* and *E* of Fig. 1.

Testing: The starter shall enter the gauge at surface *O* until the heads of the pins have passed through the holes *d*. The starter is then turned through approximately 45° and is positioned so that the heads of the pins are in close contact with surface *X*. In this position, the extremities on the heads of the pins shall not be below surface Y_1 nor shall they project beyond surface Y_2.

The centre pin as defined by the dimensions *V*-*W* may touch or move internal parts of the starter during the test.

FIG. A-2 "GO" GAUGE FOR STARTERS FOR CLASS II LUMINARIES

ANNEX B

(*Clauses* 7.12.3, 7.13, 9.3, 10.3 *and* 10.5)

BALLASTS TO BE USED FOR LIFE TESTING

B-1 A ballast used for the life testing of starters shall comply with the following three requirements:

a) It shall be of a type that will comply IS 1534 (Part 1) and correspond with the starting conditions of the lamp.

b) The rated voltage of the ballast shall lie within one of the following ranges:

Starting Test Voltage (*see* **8**)	*Ballast Rated Voltage*
Less than 110	110-130
180 and higher	220-230

c) When, at its rated voltage, it is associated with a lamp whose voltage at lamp terminals does not deviate by more than ± 2 percent from the objective values specified in IS 2418 (Part 2), the lamp shall absorb a power which does not differ from its rated value by more than ± 4 percent.

d) For pre-heated lamps operating with starter, the pre-heating current (short-circuit current) at rated voltage shall not differ by more than ± 10 percent from the nominal value specified in IS 2418 (Part 2).

ANNEX C

(*Clause* 12.2.1)

SAMPLING PROCEDURE FOR ACCEPTANCE PURPOSES

C-1 LOT

C-1.1 In a consignment, all the starters of the same type and rating manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

C-1.2 The number of starters to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 2 of Table C-1.

C-1.2.1 These starters shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS 4905 may be followed.

C-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

C-2.1 All the starters selected from the lot at random according to col 2 and col 3 of Table C-1 shall be subjected to all the acceptance tests other than endurance deactivated lamp tests. A starter failing to meet the requirements of any of these acceptance tests shall be termed as defective. The lot shall be considered as conforming to the requirements of these acceptance tests if the number of defectives found in the sample is less than or equal to corresponding acceptance number given in col 3 of Table C-1, otherwise the lot shall be rejected without further testing.

Table C-1 Sample Size and Acceptance Number

(*Clauses* C-1.2 *and* C-2.1)

Sl No.	Lot Size	Sample Size for Acceptance Tests Other Than Endurance and Deactivated Lamp Tests	Acceptance Number
(1)	(2)	(3)	(4)
i)	Up to 300	20	1
ii)	301 to 500	32	2
iii)	501 to 1 000	50	3
iv)	1 001 to 3 000	80	5
v)	3 001 and above	125	7

C-2.2 The lot which has been found a conforming to the requirements of above acceptance tests shall then be tested for endurance test and deactivated lamp test. For this purpose the number of starters to be selected from the lot shall be 5. The lot shall be considered as conforming to the requirements of these tests if no defective is found, and shall be rejected if two or more defectives is found in the sample. If one defective is found, another sample of 5 starters shall be selected from the lot at random and subjected to the test(s) in which it has failed. The lot shall be considered as conforming to the requirements of that test(s) if no defective is found in the second sample; otherwise the lot shall be rejected.

C-2.3 The lot shall be considered as conforming to the requirements of acceptance tests if **C-2.1** and **C-2.2** are satisfied.

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