

Lamp controlgear —

Part 2-8: Particular requirements for ballasts for fluorescent lamps

The European Standard EN 61347-2-8:2001 has the status of a British Standard

ICS 29.140.99

National foreword

This British Standard is the official English language version of EN 61347-2-8:2001. It is identical with IEC 61347-2-8:2000. Together with BS EN 61347-1:2001 it supersedes BS EN 60920:1991 + A1:1994 + A2:1996 which will be withdrawn on 1 November 2003.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and related equipment, to Subcommittee CPL/34/3, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 21, an inside back cover and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 May 2001

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ISBN 0 580 37407 6

EUROPEAN STANDARD

EN 61347-2-8

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2001

ICS 29.140.99

Supersedes EN 60920:1991 + A1:1993 + A2:1996

English version

Lamp controlgear
Part 2-8: Particular requirements
for ballasts for fluorescent lamps
(IEC 61347-2-8:2000)

Appareillages de lampes
Partie 2-8: Prescriptions particulières
pour les ballasts pour lampes
fluorescentes
(CEI 61347-2-8:2000)

Geräte für Lampen
Teil 2-8: Besondere Anforderungen an
Vorschaltgeräte für Leuchtstofflampen
(IEC 61347-2-8:2000)

This European Standard was approved by CENELEC on 2000-11-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 34C/505/FDIS, future edition 1 of IEC 61347-2-8, prepared by SC 34C, Auxiliaries for lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61347-2-8 on 2000-11-01.

This European Standard, together with EN 61347-1, supersedes EN 60920:1991 + A1:1993 + A2:1996.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-11-01

This standard shall be used in conjunction with EN 61347-1:2001.

NOTE In this standard, the following print types are used:

- requirements : in roman type;
- *test specifications: in italic type;*
- notes: in smaller roman type.

Annexes designated "normative" are part of the body of the standard.

In this standard, annexes A to I and ZA are normative and annex J is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61347-2-8:2000 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

This first edition of IEC 61347-2-8, published in conjunction with IEC 61347-1, represents an editorial review of IEC 60920. The formatting into separately published parts provides for ease of future amendments and revisions. Additional requirements will be added as and when a need for them is recognized.

This standard, and the parts which make up IEC 61347-2, in referring to any of the clauses of IEC 61347-1, specify the extent to which such a clause is applicable and the order in which the tests are to be performed; they also include additional requirements, as necessary. All parts which make up IEC 61347-2 are self-contained and, therefore, do not include references to each other.

Where the requirements of any of the clauses of IEC 61347-1 are referred to in this standard by the phrase "The requirements of clause n of IEC 61347-1 apply", this phrase is interpreted as meaning that all requirements of the clause in question of part 1 apply, except any which are clearly inapplicable to the specific type of lamp controlgear covered by this particular part of IEC 61347-2.

LAMP CONTROLGEAR –

Part 2-8: Particular requirements for ballasts for fluorescent lamps

1 Scope

This part of IEC 61347 specifies safety requirements for ballasts, excluding resistance types, for use on a.c. supplies up to 1 000 V at 50 Hz or 60 Hz, associated with fluorescent lamps with or without pre-heated cathodes operated with or without a starter or starting device and having rated wattages, dimensions and characteristics as specified in IEC 60081 and 60901.

This standard applies to complete ballasts and to their component parts such as reactors, transformers and capacitors. Particular requirements for thermally protected ballasts are given in annex B.

Ballasts for conventional operation of lamps at mains frequency are covered, while a.c. supplied electronic ballasts for high frequency operation are excluded. These are specified in IEC 61347-2-3.

Capacitors having a capacitance greater than 0,1 μF are covered by IEC 61048 and IEC 61049. Capacitors having a capacitance less than or equal to 0,1 μF are specified in IEC 60384-14.

Performance requirements are the subject of IEC 60921.

2 Normative references

For the purpose of this part of IEC 61347, the normative references given in clause 2 of IEC 61347-1 which are mentioned in this standard apply, together with the following normative references:

IEC 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

3 Definitions

For the purpose of this part of IEC 61347, the definitions of clause 3 of IEC 61347-1 apply, together with the following:

3.1 rated temperature rise of a ballast winding

Δt

temperature rise assigned by the manufacturer under the conditions specified in this standard

NOTE The specifications for the supply and mounting conditions of the ballast are given in annex H.

3.2

short-circuit power (of a voltage source)

quotient of the square of the voltage produced at its output terminals (in open circuit conditions) and the internal impedance of the source (as seen from the same terminals)

4 General requirements

The requirements of clause 4 of IEC 61347-1 apply, together with the following:

4.1 Capacitors and other components

Capacitors and other components incorporated in ballasts shall comply with the requirements of the appropriate IEC standard.

4.2 Thermally protected ballasts

Thermally protected ballasts shall comply with the requirements of annex B.

5 General notes on tests

The requirements of clause 5 of IEC 61347-1 apply, together with the following:

5.1 The type test is carried out on one sample consisting of eight ballasts submitted for the purpose of the type test. Seven ballasts are for the endurance test and one for all other tests. For conditions of compliance for the endurance test, see clause 13.

In addition, six ballasts are required for the high-voltage impulse testing according to clause 15 below, for ballasts intended for circuits in which high-voltage impulse occurs within the ballast. There shall be no failure during the test.

5.2 The tests are made under the conditions specified in annex H of IEC 61347-1. In general, all the tests are carried out on each type of ballast or, where a range of similar ballasts is involved, on each rated wattage in the range, or on a representative selection from the range, as agreed with the manufacturer. A reduction in the number of samples for the endurance test, according to clause 13 and including the use of constant S other than 4 500, as shown in annex E, or even the omission of these tests, is allowed when ballasts of the same construction but with different characteristics are submitted together for approval, or when test reports from the manufacturer or other authority are accepted by the testing station.

6 Classification

The requirements of clause 6 of IEC 61347-1 apply.

7 Marking

Ballasts which form an integral part of the luminaire need not be marked.

7.1 Mandatory markings

Ballasts, other than integral ballasts, shall be clearly and durably marked, in accordance with 7.2 of IEC 61347-1, with the following mandatory markings:

- items a), b), e), f) and g), of 7.1 of IEC 61347-1, together with
- the peak value of the voltage produced, if the peak value exceeds 1 500 V, with connections subjected to this voltage marked as such.

Pulse generated by a glow starter and ballast combination are exempt from this requirement.

7.2 Information to be provided, if applicable

In addition to the above mandatory markings, the following information, if applicable, shall be given either on the ballast, or be made available in the manufacturer's catalogue or similar:

- items c), h), i), j), k), o), p) and q) of 7.1 of IEC 61347-1, together with
- in the case of a ballast consisting of more than one separate unit, the current controlling inductive element(s), marked with the essential details of the other unit(s) and/or essential capacitors;
- in the case of an inductive ballast used with a separate series capacitor other than a radio interference suppression capacitor, repetition of the marking of rated voltage, capacitance and tolerance.

7.3 Other information

Manufacturers may provide the following non-mandatory information, if available:

- the rated temperature rise of the winding following the symbol Δt , values increasing in multiples of 5 K.

8 Protection against accidental contact with live parts

The requirements of clause 10 of IEC 61347-1 apply.

9 Terminals

The requirements of clause 8 of IEC 61347-1 apply.

10 Provisions for earthing

The requirements of clause 9 of IEC 61347-1 apply.

11 Moisture resistance and insulation

The requirements of clause 11 of IEC 61347-1 apply.

12 Electric strength

The requirements of clause 12 of IEC 61347-1 apply.

13 Thermal endurance test for windings

The requirements of clause 13 of IEC 61347-1 apply.

14 Ballast heating

Ballasts, including their mounting surfaces, shall not attain a temperature which would impair safety.

Compliance is checked by the tests of 14.1 to 14.4.

14.1 Pre-test, checks and measures

Before the test, the following is checked and measured:

- a) *the ballast starts and operates the lamp(s) normally;*
- b) *the resistance of each winding is measured at the ambient temperature, if required.*

14.2 Voltage across capacitors

At rated frequency, the voltage across a capacitor incorporated in a ballast shall comply with the requirements given in items a) and b) below. Such requirements do not apply to the capacitors in starters or starting devices or to those having a capacitance less than or equal to 0,1 μ F (nominal). Neither do the requirements of item b) apply to self-healing capacitors.

- a) Under normal conditions, when the ballast is tested at its rated supply voltage, the voltage across the capacitor shall not exceed the rated voltage of the latter.
- b) Under abnormal conditions (see 14.3) when the ballast is tested at 110 % of its rated supply voltage, the voltage across the capacitor shall not be greater than the appropriate test voltage of the capacitor given in table 1.

Table 1 – Abnormal conditions – Capacitor test voltages

Designation	Rated voltage U_n	Limiting voltage
Any	Rated voltage of 240 V or less, 50 Hz or 60 Hz and maximum rated temperature less than or equal to 50 °C	1,25 U_n
Non-self-healing	Other ratings, 50 Hz or 60 Hz	1,50 U_n
Self-healing	Other ratings, 50 Hz or 60 Hz	1,25 U_n

14.3 Ballast heating test

When the ballast is tested in accordance with the conditions of annex J, the temperature shall not exceed the appropriate values given in table 2 for the tests under normal and abnormal conditions, if applicable.

NOTE Abnormal circuit conditions are detailed annex D of IEC 60598-1.

Table 2 – Maximum temperatures

Parts	Maximum temperature °C		
	Normal operation at 100 % of rated voltage	Normal operation at 106 % of rated voltage	Abnormal operation at 110 % of rated voltage
Ballasts windings with declared temperature rise Δt	a		
Ballasts windings with declared temperature under abnormal conditions			b
Capacitor, if any, adjacent to the ballast case			
– without temperature declaration		50	
– with indication of t_c		t_c	
Parts made of			
– wood-filled phenolic mouldings		110	
– mineral-filled phenolic mouldings		145	
– urea mouldings		90	
– melamine mouldings		100	
– laminated, resin bonded paper		110	
– rubber		70	
– thermoplastic materials		c	
<p>NOTE 1 If materials or manufacturing methods are used other than those indicated in this table, they must not be operated at temperatures higher than those which are proved to be permissible for those materials.</p> <p>NOTE 2 The temperature in this table must not be exceeded when the ballast is operated at its maximum declared ambient temperature, if any. Maximum ambient temperature for a ballast, if not declared, must be considered as the difference between t_w and the measured winding temperature rise at Δt at 100 % nominal voltage.</p>			
<p>^a The measurement of the temperature rise of the windings under normal conditions at 100 % of rated voltage – i.e. verification of a declared value so as to provide information for luminaire design – is non-mandatory and its measurement is only performed when marked on the ballast or otherwise required in the catalogue.</p> <p>^b This measurement is only mandatory for circuits which may produce abnormal conditions. The declared limiting temperature of the windings under abnormal conditions shall not be higher than the value which corresponds to a number of days equal to at least two-thirds of the theoretical endurance test period (see table 3).</p> <p>^c The temperature of thermoplastic material, other than that used for the insulation of the wiring, which provides protection against contact with live parts or supporting such parts, is also measured. Values thus obtained serve to establish the conditions of the test of 18.1 of IEC 61347-1.</p>			

Table 3 – Limiting temperatures of windings under abnormal operating conditions and at 110 % of rated voltage for ballasts subjected to an endurance test duration of 30 days

Constant S	Limiting temperature °C					
	S4,5	S5	S6	S8	S11	S16
For $t_w =$ 90	171	161	147	131	119	110
95	178	168	154	138	125	115
100	186	176	161	144	131	121
105	194	183	168	150	137	126
110	201	190	175	156	143	132
115	209	198	181	163	149	137
120	217	205	188	169	154	143
125	224	212	195	175	160	149
130	232	220	202	182	166	154
135	240	227	209	188	172	160
140	248	235	216	195	178	166
145	256	242	223	201	184	171
150	264	250	230	207	190	177

NOTE Unless otherwise indicated on the ballast, the limiting temperatures specified in column S4,5 apply.

For ballasts which are subjected to an endurance test duration of longer than 30 days, the limiting temperatures shall be calculated using equation 2 of clause 13 of IEC 61347-1, but for an objective test life (in days) equal to two-thirds of the theoretical endurance test period.

14.4 After these heating tests, the ballast shall be allowed to cool to room temperature and shall comply with the following conditions:

- a) the ballast marking shall still be legible;
- b) the ballast shall withstand without damage a voltage test according to clause 12, the test voltage, however, being reduced to 75 % of the values given in IEC 61347-1, but not less than 500 V.

15 High-voltage impulse testing

Ballasts marked in accordance with 7.1 additional requirement shall be subjected to the test either in 15.1 or 15.2 below.

Simple reactor type ballasts shall be subjected to the test in 15.1.

Ballasts other than simple reactor type ballasts shall be subjected to the test in 15.2. The manufacturer shall declare to which test his product has been subjected.

15.1 From the six samples to 5.1, three are subjected to the moisture resistance and dielectric strength test specified in clauses 11 and 12.

The remaining three samples are heated in an oven until they attain the temperature t_w marked on the ballast.

Immediately following these pre-conditioning tests, all six samples shall withstand the high-voltage impulse test.

The ballast under test, together with a variable resistor and a suitable circuit breaker with a closing time (bounce time excluded) between 3 ms and 15 ms – for example, a vacuum switch type H16 or VR312/412 – is connected to a d.c. current in such a way that, by adjusting the current and operating the circuit breaker, voltage pulses will be induced in the ballast. The current is then adjusted slowly, increasing so that the peak voltage marked on the ballast is reached. The measurement of the voltage pulses is made directly at the ballast terminations and in accordance with annex I.

NOTE 1 If electronic circuit breakers with a very short closing time are used, care must be taken against producing a very high induced pulse voltage.

The value of the d.c. current at which the starting voltage is reached is noted. The samples are then operated with this current for 1 h and the current is interrupted during this time, 10 times for 3 s within every minute.

Immediately after the test all six ballasts shall withstand the moisture resistance and insulation test specified in clauses 11 and 12.

NOTE 2 For testing circuits with series capacitors, the capacitor must be short-circuited.

15.2 Without connection of the lamp on the output side of the ballast, the supply voltage is adjusted in order to obtain the pulse voltage, generated by the starter and the ballast, of the marked value on the ballast. Cathode heating windings of the ballast are loaded with dummy resistors.

Then, the ballast is operated under these conditions without a lamp for a period of 30 days.

Number of samples, before-test treatment and conditions after the test are the same as those prescribed in 15.1.

Ballasts which are marked for exclusive use with an ignitor having a time delay device are subjected to the same test, but for a period consisting of 250 on/off cycles, keeping an off period of at least 2 min.

16 Fault conditions

The requirements of clause 14 of IEC 61347-1 are not applicable.

17 Construction

The requirements of clause 15 of IEC 61347-1 apply.

18 Creepage distances and clearances

The requirements of clause 16 of IEC 61347-1 apply, together with the following:

In open-core ballasts, enamel, or similar material which forms the insulation for a wire and withstands the voltage test for grade 1 or grade 2 of IEC 60317-0-1 (clause 13) is judged to contribute 1 mm to the values given in tables 3 and 4 of IEC 61347-1 between enamelled wires of different windings or from enamelled wire to covers, iron cores, etc. However, this applies only in the situation where creepage distances and clearances are not less than 2 mm in addition to the enamelled layers.

19 Screws, current-carrying parts and connections

The requirements of clause 17 of IEC 61347-1 apply.

20 Resistance to heat, fire and tracking

The requirements of clause 18 of IEC 61347-1, with the exception of 18.5, apply.

21 Resistance to corrosion

The requirements of clause 19 of IEC 61347-1 apply.

Annex A
(normative)

**Test to establish whether a conductive part is a live part
which may cause an electric shock**

The requirements of annex A of IEC 61347-1 apply.

Annex B
(normative)

Particular requirements for thermally protected lamp controlgear

The requirements of annex B of IEC 61347-1 apply.

Annex C
(normative)

**Particular requirements for electronic lamp controlgear with means
of protection against overheating**

The requirements of annex C of IEC 61347-1 do not apply.

Annex D
(normative)

**Requirements for carrying out the heating tests of thermally
protected lamp controlgear**

The requirements of annex D of IEC 61347-1 apply.

Annex E
(normative)

Use of constant S other than 4 500 in t_w tests

The requirements of annex E of IEC 61347-1 apply.

Annex F
(normative)

Draught-proof enclosure

The requirements of annex F of IEC 61347-1 apply.

Annex G
(normative)

Explanation of the derivation of the values of pulse voltages

The requirements of annex G of IEC 61347-1 do not apply.

Annex H
(normative)

Tests

The requirements of annex H of IEC 61347-1 apply.

Annex I (normative)

Method for selection of varistors

I.1 General

In order to avoid voltage variations during measurement of voltage pulses, a number of varistors in series is connected in parallel to the ballast under test.

Due to the energy involved, the smallest types of varistors are sufficient for this purpose.

The voltage built up within the ballast depends not only on its inductance, the d.c. current and the capacitance C_2 , but also on the quality of the vacuum switch, as part of the energy stored in the ballast will be discharged via the spark occurring at the switch.

Therefore, it is necessary to select the varistors together with the switch used for the circuit.

Due to the fact that the varistors have tolerances which may add or compensate themselves, an individual selection is necessary for each type of ballast to be tested.

I.2 Selection of the varistors

The ballast current is first adjusted so that the voltage across C_2 is approximately 15 % to 20 % higher than the foreseen test voltage.

The voltage is then reduced to the intended value by means of varistors connected in series.

It is advisable to take two or three high-voltage varistors to cover the greatest part of the test voltage and to use one or two varistors of lower voltage to cover the rest of the test voltage. The fine adjustment of the test voltage can then be made by varying the current through the ballast.

Approximate values for the voltage of the single varistors can be chosen from the voltage current characteristics given in the relevant varistor data sheets (for example, voltage value at $I = 10 \text{ mA}$).

Annex J (informative)

Explanation of ballast temperatures

NOTE This annex does not introduce any new proposal but reflects the current state of the requirements.

The object of ballast temperature requirements is to verify that the ballast functions safely during its intended life.

Ballast life is determined by the quality of the wire insulation connected with the ballast construction.

The thermal behaviour of a ballast is thus characterized by the following aspects:

- a) endurance;
- b) ballast heating;
- c) test arrangement.

The following explanation applies to coil type ballasts.

J.1 Endurance

The starting point is the claimed ballast winding temperature t_w , denoting the temperature which gives a life expectancy of at least 10 years' continuous operation at that temperature. The relation between winding temperature and ballast life can be calculated from the following equation:

$$\log L = \log L_o + S \left(\frac{1}{T} - \frac{1}{T_w} \right) \quad (\text{J.1})$$

where

L is the objective test life in days, 30 days being the standard but the manufacturer may ask for a longer testing time at a related lower temperature;

L_o = 3 652 days (10 years);

T is the theoretical test temperature ($t + 273$) K;

T_w is the rated maximum operating temperature ($t_w + 273$) K;

S is the constant depending on the design of the ballast and the winding insulation used. If no claim is made to the contrary, S is taken to be 4 500 but a manufacturer may claim the use of other values if this is justified by the relevant tests.

Consequently the endurance test can be carried out in a much shorter time than 10 years at a related higher winding temperature. The standard endurance test period is 30 days, but longer test durations, up to 120 days, are permitted.

J.2 Ballast heating

For ballasts designed to be built into a luminaire, it should be checked that the assigned ballast winding temperature (t_w) in the luminaire is not exceeded under normal operating conditions, in accordance with the luminaire standard.

Moreover, under abnormal operating conditions, such as a short-circuited starter in a fluorescent lamp circuit, the luminaire is checked to see that the relevant limit which has to be marked on the ballast is not exceeded. This limit is specified as the temperature corresponding to a life of two-thirds of the test time for the ballast endurance test. This requirement is based on and derived from the tables with limiting temperatures and theoretical test temperatures for a ballast subject to an endurance test duration of 30 days and based on the assumption that a t_w 90 ballast is comparable in requirements to ballast without temperature marking, and with layers separated by paper.

The above information means that the limiting temperature under abnormal conditions is for example the temperature corresponding to a 20-day life span for a ballast subjected to a 30-day endurance test. This relation is based on the traditional limits for the limiting temperature of windings and the objective test temperature for the endurance test. However, the manufacturer is free to mark a lower temperature if he so wishes.

Verification in the luminaire is based on the limiting values marked on the ballast. This implies that if a manufacturer has elected to use a longer endurance test, at a correspondingly lower temperature, then the maximum permissible temperature under abnormal conditions is correspondingly reduced.

J.3 Test arrangement

Originally, ballast temperatures were checked on a ballast in a test arrangement which was a simulation of a batten luminaire (see figure J.1), modified several times to improve reproducibility. The latest test arrangement is with the ballast lying on wooden supports (see figure H.1 of IEC 61347-1). Practice has shown, however, little or no correlation between the temperatures measured on the ballast in that test arrangement and the actual temperatures when the ballast was built into a particular luminaire. For this reason, measurement of ballast heating in this test arrangement has been dropped and replaced by a much more realistic measurement based on the maximum permitted winding temperature t_w .

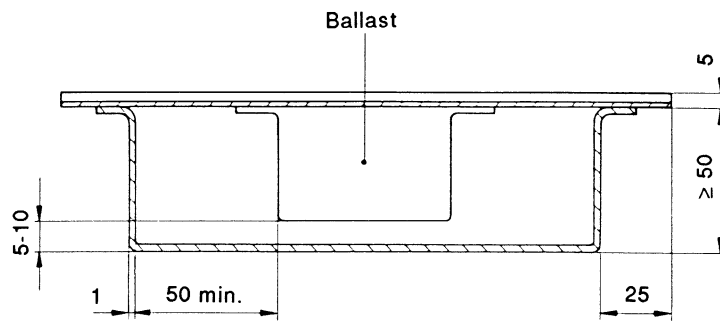
The ballast heating test has thus been modified to represent the worst conditions in the luminaire permitted by the ballast manufacturer through the claimed value of t_w . Lamp control-gear parts are then checked with the ballast operating in an oven until the marked winding temperature is reached.

Consequently, verification that the ballast winding temperature is not exceeded takes place in the luminaire. Lamp controlgear winding temperatures are then measured under normal as well as abnormal conditions of operation and compared against the marked values.

Built-in ballasts designed to be built into enclosures other than luminaires, such as a pole, box or the like, are also tested in the test arrangement of figure H.1 of IEC 61347-1, as specified for built-in ballasts. Since these ballasts are not built into a luminaire, compliance with the temperature limits as specified in the luminaire standard is also checked in this test arrangement.

Independent ballasts are tested in a test corner. The test corner consists of three wooden boards arranged so as to simulate two walls and the ceiling of a room (see figure J.2).

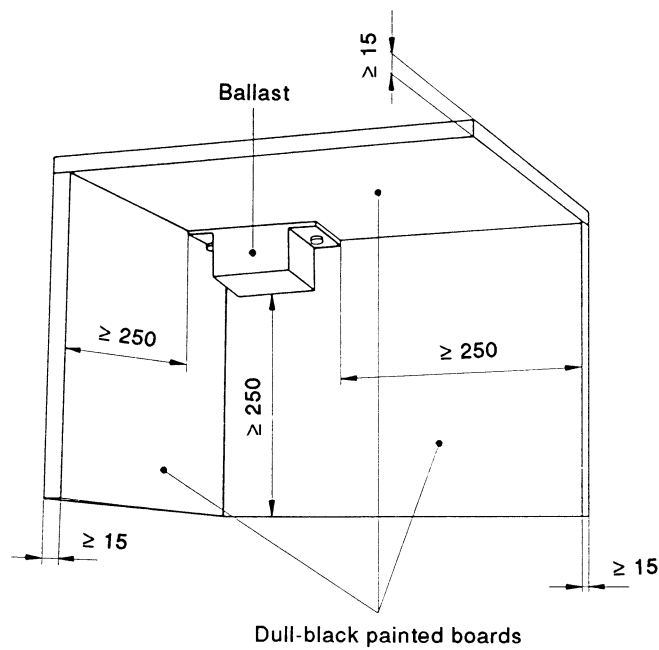
All measurements are carried out in a draught-proof enclosure, as described in annex F.



IEC 601/2000

Dimensions in millimetres

Figure J.1 – Test hood for ballast heating test



IEC 602/2000

Dimensions in millimetres

Figure J.2 – Test corner for ballast heating

Bibliography

IEC 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 61048, *Capacitors for use in tubular fluorescent and other discharge lamp circuits – General and safety requirements*

IEC 61049, *Capacitors for use in tubular fluorescent and other discharge lamp circuits – Performance requirements*

IEC 61347-2-3, *Lamp controlgear – Part 2-3: Particular requirements for a.c. supplied electronic ballasts for fluorescent lamps* ¹⁾

¹⁾ To be published.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61347-1	2000	Lamp controlgear Part 1: General and safety requirements	EN 61347-1	2001

BS EN
61347-2-8:2001
IEC
61347-2-8:2000

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