

Specification for

General and safety requirements for ballasts for discharge lamps (excluding tubular fluorescent lamps)

This European Standard EN 60922 : 1991 has the status of a
British Standard

Ballasts pour lampes à décharge (à l'exclusion
des lampes tubulaires à fluorescence)
Prescriptions générales et prescriptions de
sécurité

Vorschaltgeräte für Entladungslampen
(ausgenommen für röhrenförmige
Leuchtstofflampen)
Allgemeine und Sicherheits-Anforderungen

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the National Committees of the following countries.

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

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The following BSI references relate to the work on this standard:
Committee reference LGL/21
Draft for comment 86/25170 DC

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Amendments issued since publication

Amd. No.	Date	Text affected
7173	September 1992	Indicated by a double line in the margin

Amendment No. 2
published and effective from 15 May 1994
to BS EN 60922 : 1991

Specification for general and safety requirements
for ballasts for discharge lamps (excluding tubular
fluorescent lamps)

NOTE 1. The English language version of European Standard EN 60922 was implemented in the United Kingdom by the publication of BS EN 60922 : 1991. This amendment implements amendment A2 to EN 60922 : 1991. This amendment together with the European Standard EN 60922 : 1991 has the status of a British Standard.

NOTE 2. Amendment A2 to EN 60922 incorporates amendment A1 to EN 60922. Amendment A2 is distinguished by side rules in the margin.

Revised text

National foreword

In paragraph 1, line 4, after 'A1 : 1992,' insert 'and A2 : 1993,'.

In paragraph 1, line 6, after 'Amendment No. 1 : 1990' insert 'and Amendment No. 2 : 1992'.

AMD 8140/May 1994

EN title page and foreword

Insert the attached EN title page (foreword on reverse).

AMD 8140/May 1994

Text of EN 60922

Amend the text of European Standard EN 60922 in accordance with the details given on the attached pages.

AMD 8140/May 1994

National appendix NA

Last paragraph of preface, list of IEC publications quoted, add the following standards:

82 (1984):	Ballasts for tubular fluorescent lamps.
112 (1979):	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.
216:	Guide for the determination of thermal endurance properties of electrical insulating materials.
417C (1977):	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets. Third supplement.
598-1 (1986):	Luminaires – Part 1: General requirements and tests.

Delete the following from the list of publications quoted:

410 (1973):	Sampling plans and procedure for inspection by attributes.
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AMD 8140/May 1994

National appendix NC

Insert in correct numerical order the following reference.

IEC 112 : 1979	BS 5901 : 1980 Method of test for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions (Identical)
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AMD 8140/May 1994

Descriptors: Lighting equipment, discharge lamp, electrical ballast, specification, safety, test

Amendment A2 to the English version of EN 60922

Ballasts for discharge lamps (excluding tubular fluorescent lamps) – General and safety requirements

(IEC 922 : 1989/A2 : 1992)

Ballasts pour lampes à décharge (à l'exclusion des lampes tubulaires à fluorescence)
Prescriptions générales et prescriptions de sécurité
(CEI 922 : 1989/A2 : 1992)

Vorschaltgeräte für Entladungslampen (ausgenommen röhrenförmige Leuchtstofflampen) – Allgemeine und Sicherheits-Anforderungen
(IEC 922 : 1989/A2 : 1992)

This amendment A2 modifies the European Standard EN 60922 : 1991. It was approved by CENELEC on 1993-09-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 amendment 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

At the request of the CENELEC Technical Committee TC 34Z, Luminaires and associated equipment, amendment 2 : 1992 (including amendment 1 : 1990) to the International Standard IEC 922 : 1989 was submitted to the CENELEC Unique Acceptance Procedure (UAP).

The text of the draft was approved by CENELEC as amendment A2 to EN 60922 on 22 September 1993.

This amendment A2 includes EN 60922 : 1991/A1 : 1992.

The following dates were fixed:

- latest date of publication of
an identical national standard (dop) 1994-09-01
- latest date of withdrawal of
conflicting national standards (dow) 1994-09-01

For products which have complied with EN 60922 : 1991 and its amendment A1 : 1992 before 1994-09-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-09-01.

Annexes designated 'normative' are part of the body of the standard. In this standard, annex ZA is normative.

Editorial corrections to IEC 922/A2:

Clause E3 In the third paragraph replace 'IEC 922' by 'IEC 920'.

Figure 4 In the vertical axis, replace the existing text by the following:

Température de l'enroulement en °C
Winding temperature in °C

Annex ZA (normative)

Other international publications quoted in this standard with the references of the relevant 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.

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

IEC Publication	Date	Title	EN/HD	Date
82	1984	Ballasts for tubular fluorescent lamps	–	–
112	1979	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions	HD 214 S2	1980
216	–	Guide for the determination of thermal endurance properties of electrical insulating materials	–	–
417C	1977	Graphical symbols for use on equipment Index, survey and compilation of the single sheets Third supplement	HD 243 S10*	1993
598-1 (mod)	1986	Luminaires – Part 1: General requirements and tests	EN 60598-1*	1989

Delete the following from the list of publications quoted:

410 : 1973 – Sampling plans and procedure for inspection by attributes

* HD 243 S10 is based on IEC 417 : 1973 and its supplements A : 1974 to K : 1991. EN 60598-1 : 1989 is superseded by EN 60598-1 : 1993, which is based on IEC 598-1 : 1992, mod.

INTRODUCTION

Amend the note following the first paragraph to read:

Note.– Safety requirements ensure that electrical equipment constructed in accordance with these requirements does not endanger the safety of persons, domestic animals or property when properly installed and maintained, and used in applications for which it was intended.

Add the following new sentence to the third paragraph, between the present first and second sentences:

In addition, for ballasts which are subjected to abnormal conditions, the limiting temperature is given, which shall not be exceeded when the ballast is built into a luminaire.

Delete the second and third sentences of the fourth paragraph, and replace them with the following new sentence:

At the manufacturer's choice, optional endurance test periods of 60, 90 or 120 days may be used.

2. Definitions

2.2 Reference ballast

On the first line, delete the word: -type.

2.10 Rated maximum operating temperature of a capacitor case. Symbol t_c .

Delete in the description the words: of the component.

2.11 Rated maximum operating temperature of a ballast winding. Symbol t_w

Modify the first line to read: Temperature assigned by the manufacturer as the highest at which the ...

2.18 Ignitor

At the end of the definition, add: (IEC Publications 926 and 927).

4.3 Amend the last line of the second paragraph to read: ... using three other ballasts and ...

6. Marking

6.1 Mandatory markings

Amend the following items:

- c) *Fourth line, delete the words:* clearly and durably.

6.2 Information to be provided, if applicable.

Amend items c), f) and g) as follows:

- c) The test period for the endurance test for ballasts which, at the manufacturer's choice, have to be tested for a longer period than 30 days.

This information may be indicated with the symbol D, followed by the appropriate number of days, 60, 90 or 120 in tenths and the whole being placed between brackets immediately after the t_w indication. For example (D6) for ballasts to be tested for a test period of 60 days.

Note.— The standard endurance test period of 30 days need not be indicated.

- f) *Add the following requirement:*

Symbol: relevant value(s) in mm² followed by a small square ... □ .

- g) *Second line, amend to read:* ... accidental contact with live parts.

Add new item i) as follows:

- i) Advice to installer to prevent overheating of ballasts and associated components in a multi-ballast installation when mounted in poles, boxes, etc.

11.1 After the second paragraph, add the following new paragraph:

Ballasts which are marked for the exclusive use with an ignitor having a time-delay device, see subclause 6.2 e) ii), 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.

12. Thermal endurance of windings

Amend the third sentence of the third paragraph, as follows:

The thermal conditions shall be so adjusted that the objective duration of the test is as indicated by the manufacturer.

13. Ballasts heating

TABLE II – *Maximum temperatures*¹⁾

In the last column, Abnormal operation at 110 %³⁾ of rated voltage, delete the values: 60 and $t_c + 10$.

Following Table II, amend Note 3) as follows:

- 3) The declared limiting temperature of the windings under abnormal conditions (if any) is not measured but should correspond to a number of days at least equal to two-thirds of the theoretical endurance test period (see table IV) so as to provide information for luminaire design.

13.3 *Delete item b) and replace with the following text:*

- b) Independent ballasts are tested in a test corner (see figure 6) consisting of three dull-black painted boards at least 15 mm thick and arranged so as to imitate the corner section of two walls and the ceiling of a room. The ballast is secured to the ceiling extending at least 250 mm beyond the other sides of the ballast. The test corner is placed in a draught-free enclosure (see Appendix C).

Other test conditions remain the same as for built-in ballasts.

13.3 *Add the following new item c):*

- c) *Built-in ballasts, designed to be built into enclosures other than luminaires, are tested as detailed for built-in ballasts and shall comply with the same temperature limits as specified in Section Twelve of IEC 598-1.*

14. Current-carrying parts and connections

Delete the whole of this clause and replace with:

14. Screws, current-carrying parts and connections

Screws, current-carrying parts and mechanical connections, the failure of which might cause the ballast to become unsafe, shall withstand the mechanical stresses occurring in normal use.

Compliance is checked by inspection and the tests of Section Four, Clauses 4.11 and 4.12 of IEC 598-1.

15. Creepage distances and clearances

Replace the text of this clause of the following:

Creepage distances and clearances shall not be less than the values given in Tables VA and VB, as appropriate.

The contribution to the creepage distance of any groove less than 1 mm wide shall be limited to its width.

Any air-gap of less than 1 mm shall be ignored in computing the total air path.

Note. – Creepage distances are distances in air, measured along the surface of insulation.

A metal enclosure shall have an insulating lining if, in the absence of such a lining, the creepage distance or clearance between live parts and the enclosure would be smaller than the value prescribed below.

Ballasts, where the components are so encapsulated in a self-hardening compound bonded to the relevant surfaces that no clearances in air exist, are not checked.

In open-core ballasts, enamel or the lie, which forms the insulation for a wire and withstands the voltage test for grade 1 or grade 2 of IEC Publication 317 (clause 13), is judged to contribute 1 mm to the values given in Tables VA and VB between enamelled wires of different windings or from enamelled wires to covers, iron cores, etc. However, this applies only in the situation where the creepage distances and clearances are not less than 2 mm in addition to the enamelled layers.

Note. – Distances between windings are not measured because they are checked with the endurance test.
This applies also to distances between taps.

TABLE VA – Minimum distances for a.c. (50 Hz/60 Hz) sinusoidal voltages

R.M.S. working voltage not exceeding (V)	50	150	250	500	750	1 000
Minimum distances (mm)						
1) Between live parts of different polarity and						
2) Between live parts and accessible metal parts which are permanently fixed to the ballast, including screws or devices for fixing covers or fixing the ballast to its support						
– Creepage distances						
insulation PTI ≥ 600	0,6	1,4	1,7	3	4	5,5
< 600	1,2	1,6	2,5	5	8	10
– Clearances	0,2	1,4	1,7	3	4	5,5
3) Between live parts and a flat supporting surface or a loose metal cover, if any, if the construction does not ensure that the values under 2) above are maintained under the most unfavourable circumstances						
– Clearances	2	3,2	3,6	4,8	6	8
Notes 1) PTI (proof tracking index) in accordance with IEC 112. 2) In the case of creepage distances to parts not energized or not intended to be earthed where tracking cannot occur, the values specified for material with PTI ≥ 600 apply for all materials (in spite of the real PTI). For creepage distances subjected to working voltages of less than 60 s duration the values specified for materials with PTI ≥ 600 apply for all materials. 3) For creepage distances not liable to contamination by dust or moisture the values specified for material with PTI ≥ 600 apply (independent of the real PTI).						

TABLE VB – Minimum distances for non-sinusoidal pulse voltages

Rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
Minimum distances (mm)							
Clearances	1,0	1,5	2	3	4	5,5	8

For distances subjected to both sinusoidal voltage as well as non-sinusoidal pulses, the minimum required distance shall not be less than the highest value indicated in either table.

Creepage distances shall not be less than the required minimum clearance.

16. Resistance to heat, fire and tracking

16.2 Amend the second paragraph to read:

For materials other than ceramic, compliance is checked by the test of subclause 16.3 or 16.4, as appropriate. Printed boards are not tested as above, but in accordance with subclause 4.3 of IEC 249-1.

16.3 At the end of this subclause, add the following test condition:

- *any flame or glowing of the specimen shall extinguish within 30 s of withdrawing the glow-wire and any flaming drops shall not ignite a piece of five-layer tissue paper, specified in subclause 6.86 of ISO 4046 spread out horizontally 200 mm ± 5 mm below the test specimen.*

16.4 Amend the second line of the last paragraph to read:

... a piece of five-layer tissue paper, specified in subclause 6.86 of ISO 4046, spread out horizontally 200 mm ± 5 mm below the test specimen.

APPENDIX A: Thermal endurance test for windings

Clause A1

Amend the last paragraph of this clause as follows:

In general, to obtain normal operating conditions, the ballast shall be tested with the appropriate lamps.

The ballast container, if made of metal, shall be earthed. Lamps shall always be kept outside the oven.

For certain inductive ballasts of simple impedance, the test may be made without a lamp provided the current is adjusted to the same value as found with the lamp at rated supply voltage. The ballast shall be connected to the power supply so that the voltage stress between ballast winding and earth is similar to the one in the lamp method.

Clause A2

Delete from the last line of the second paragraph: ... or VIB as appropriate, and substitute Table VIA by Table VI.

TABLE VIA

Re-number as Table VI and amend the column heading to read:

Theoretical test temperatures: t (°C)

Table VIB

Delete the table and the note, and replace with the following:

For ballasts which have to be tested for a longer test duration than 30 days, the theoretical test temperatures shall be calculated by means of equation (2) as explained in the note at the end of Clause A3.

Clause A3

In the first note, amend the equation (1) to read:

$$t_2 = \frac{R_2}{R_1} (234,5 + t_1) - 234,5 \quad (1)$$

At the end of the clause, delete from line 1 of the second note: Tables VIA and VIB and substitute: Table VI.

After Appendix D, add the following new Appendix E:

APPENDIX E

EXPLANATION TO BALLAST TEMPERATURES

Remark – This explanation does not introduce any new proposals but reflects the current state of the requirements.

The object of ballast temperature requirements is to verify that ballasts function safely during their intended life.

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

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

- 1) endurance;
- 2) ballast heating;
- 3) test arrangement.

The following explanation applies to coil-type ballasts.

E1. Endurance

The starting point forms the claimed ballast winding temperature t_w , denoting the temperature which gives a life expectancy of at least ten years' continuous operation at that temperature. The relation between winding temperature and ballast life can be calculated from the following equation (see figure 4).

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

in which:

- 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 is 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 materials 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.

E2. Ballast heating

For ballast designed to be built into a luminaire, it has to be checked that the assigned ballast winding temperature (t_w) in the luminaire shall not be 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 shall be checked to see that the relevant limit which has to be marked on the ballast, is not exceeded. This limit is specified to be that 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 ballasts subjected to an endurance test duration of 30 days (see IEC 82) and based on the assumption that a $t_w - 90$ ballast is comparable in requirements to a ballast without temperature marking with layers separated by paper (see IEC 82).

The above means that the limiting temperature under abnormal conditions is e.g. 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 in IEC 82 for the limiting temperatures 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 will be based on the limiting values marked on the ballast. The above also 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.

E3. Test arrangement

Originally, ballast temperatures were checked on ballasts in a test arrangement which was a simulation of a batten luminaire (see figure 7), modified several times to improve reproducibility. The latest test arrangement is with the ballast lying on wooden blocks (see figure 2). 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 . Ballast parts are then checked with the ballast operating in an oven until the marked winding temperature is reached (see IEC 922).

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

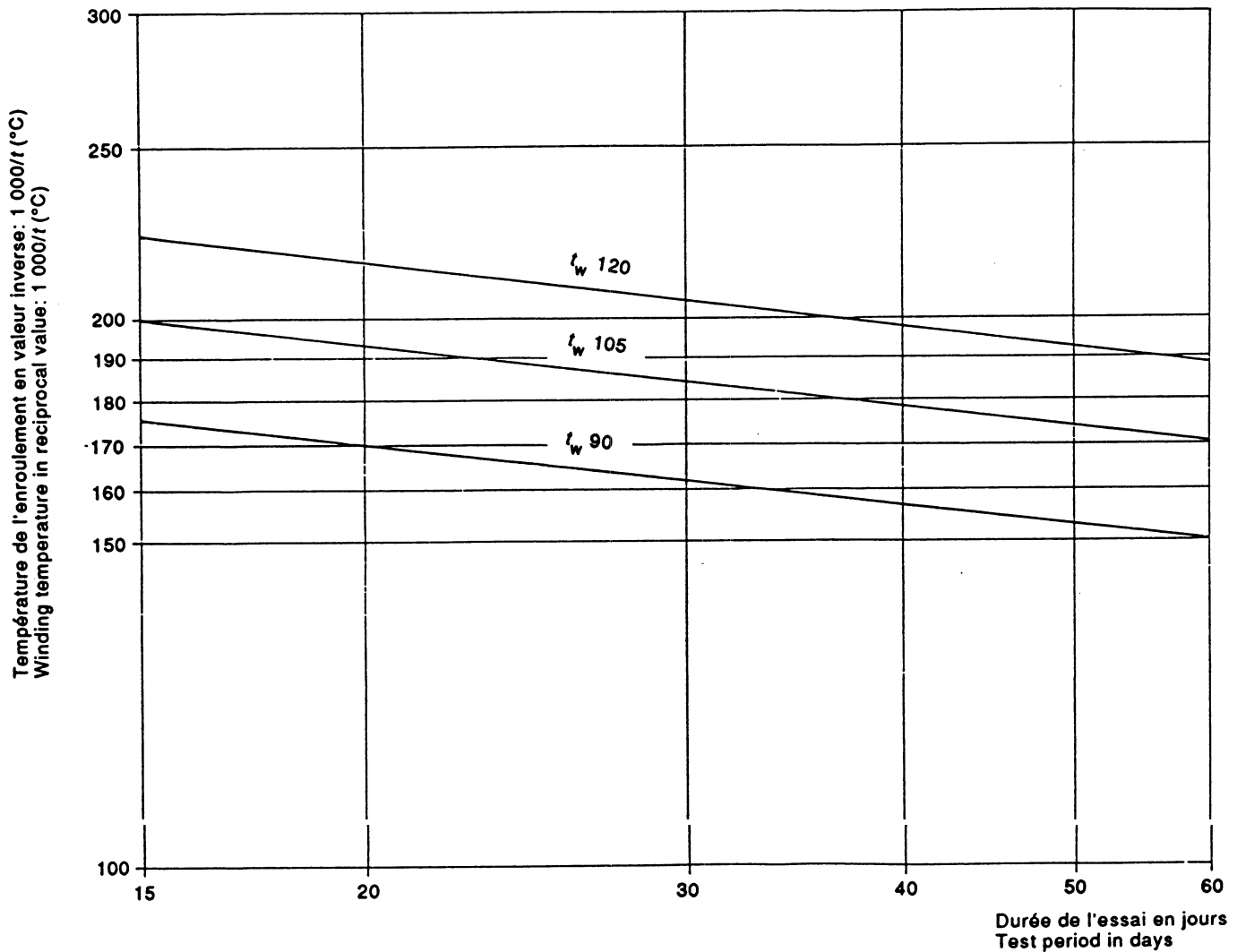
Built-in ballasts designed to be built into enclosures other than luminaires, such as a pole, a box or the like, are also tested in the test arrangement of figure 2 as specified for built-in ballasts. Since these ballasts are not built into a luminaire, compliance with the temperature limits as specified 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 imitate two walls and the ceiling of a room (see figure 6).

All measurements are carried out in a draught-free enclosure as described in the relevant standard.

Figure 4: Supprimer et remplacer par la nouvelle figure 4 suivante:

Figure 4: Delete and replace with the following new figure 4:



CEI-IEC 104092

Les courbes tracées sur la figure ne sont représentées qu'à titre d'information: elles traduisent les résultats fournis par l'application de la formule (2) avec une constante S égale à 4 500 (voir annexe A).

These curves are for information only and illustrate equation (2) using a constant S of 4 500 (see Appendix A).

Figure 4 – Relation entre la température de l'enroulement et la durée de l'essai
Relation between winding temperature and test duration

Figure 5: Supprimer et remplacer par la nouvelle figure 5 suivante:

Figure 5: Delete and replace with the following new figure 5:

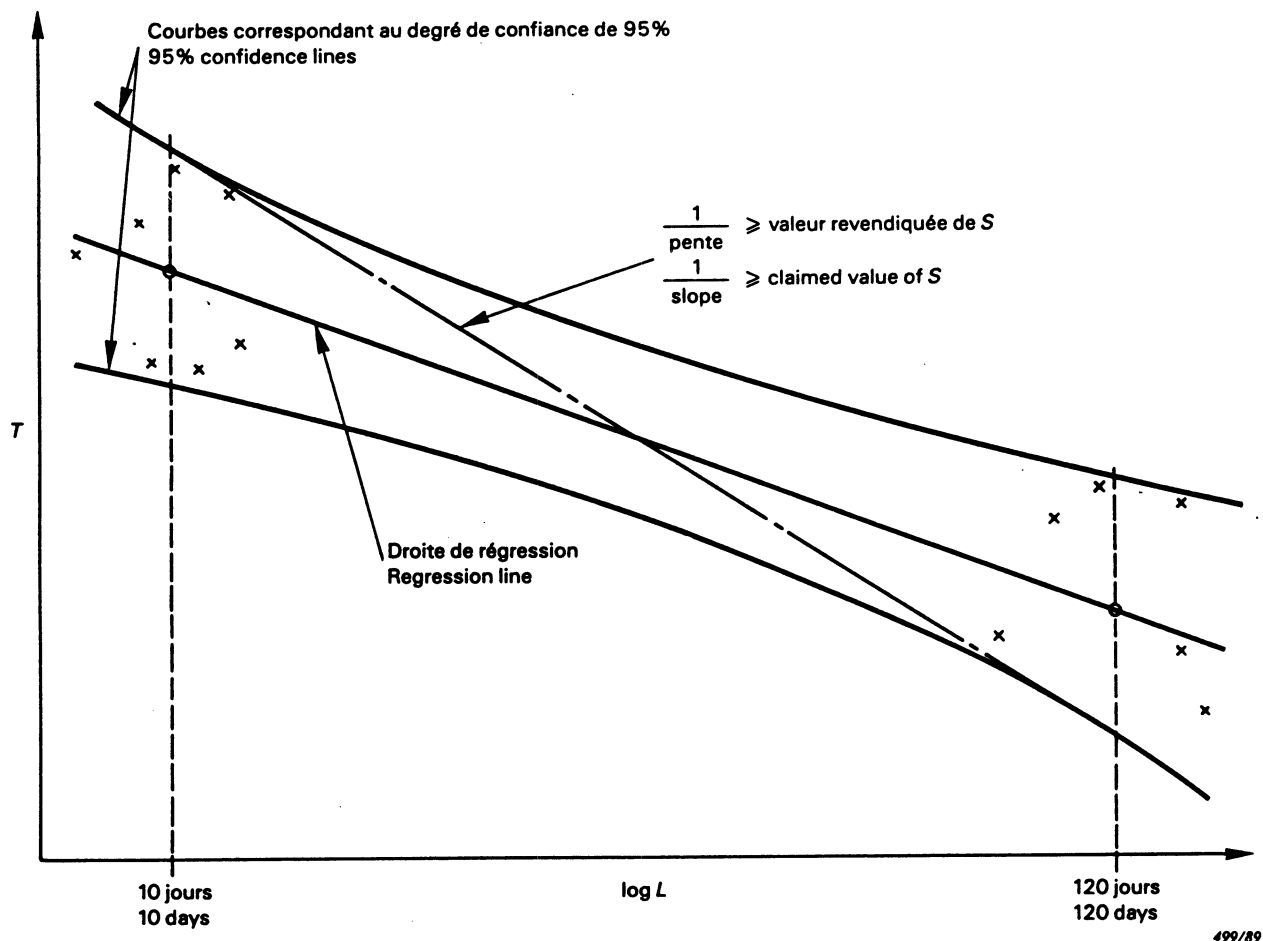


Figure 5 – Contrôle de la valeur revendiquée de S
Assessment of claimed value of S

