

Specification for

Single-capped fluorescent lamps. Safety and performance requirements

The European Standard EN 60901 : 1990, with the incorporation of its amendment A1 : 1990 and A2 : 1993, has the status of a British Standard

Lampes à fluorescence à culot unique —
Prescriptions de sécurité et de performances

Einseitig gesockelte Leuchtstofflampen
Anforderungen an Sicherheit und
Arbeitsweise

UDC 621.327 : 614.8

Coopérating 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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National foreword

This British Standard has been prepared under the direction of the Electrical Illuminations Standards Policy Committee and is the English language version of EN 60901 : 1990 and its Amendment A1 (1990) and Amendment A2 (1993) *Single-capped fluorescent lamps — Safety and performance requirements*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 901 : 1987 plus Amendment 1 (1987), Amendment 2 (1992) and Corrigendum (1992) published by the International Electrotechnical Commission (IEC).

This standard supersedes BS 6982 : 1988 which is withdrawn.

The foreword of the EN amendment A2 makes reference to 'date of withdrawal (dow) of conflicting national standards' as '1994-10-01'. In this case the relevant national standard is BS 6982 but the date of withdrawal relates only to those parts of the British Standard subject to Amendment A2. Certificates and marks will not be awarded after this date with respect to the British Standard not incorporating Amendment A2. They will be awarded only to the amended British Standard. However such certificates and marks already awarded with respect to the British Standard not incorporating Amendment A2 may continue to apply for production until 1999-10-01.

This standard is supplied in the form of separate standard sheets within a loose-leaf folder. Amendments containing new or revised standard sheets will be issued in the future to ensure that this standard may be kept up to date.

The following print types are used in this standard:

requirements	in roman type
<i>test specifications</i>	<i>in italic type</i>
explanatory matter	in small roman type

Compliance with a British Standard does not of itself confer immunity from legal obligations.

UDC 621.327 : 614.8

Descriptors: Lighting equipment, fluorescent lamp, lamp cap, safety, requirement

English version

Single-capped fluorescent lamps — Safety and performance requirements (includes amendment A1 : 1990 and amendment A2 : 1993)

(IEC 901 : 1987/A2 : 1992 + Corrigendum 1992)

Lampes à fluorescence à culot unique —
Prescriptions de sécurité et de performances
(CEI 901 : 1987/A2 : 1992 +
Corrigendum 1992)

Einseitig gesockelte Leuchtstofflampen —
Anforderungen an Sicherheit und
Arbeitsweise
(IEC 901 : 1987/A2 : 1992 +
Corrigendum 1992)

This European Standard was approved by CENELEC on 12 June 1989. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The CENELEC Questionnaire Procedure, performed for finding out whether or not IEC 901 : 1987 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard (EN). The Reference Document was submitted to the CENELEC members for formal vote and acceptance by CENELEC.

The text of the International Standard IEC 901 : 1987 was approved by CENELEC on 12 June 1989 as a European Standard with the following information:

At the 60th Technical Board it was confirmed that as far as safety is concerned only the following subclauses of this standard apply:

- 1.1 Scope
- 1.2 Definitions
- 1.4 Marking
- 1.7 Cap dimensions
- 2.3 Cap requirements
- 2.7 Thermal conditions

Annexes designated 'normative' are part of the body of the EN.

In this standard, Annex ZA is normative.

The following dates are applicable:

- latest date of announcement of the EN at national level (doa): 1989-12-01
- date of latest publication of a new harmonized standard (dop): 1990-06-01
- date of withdrawal of conflicting national standards (dow): 1990-06-01

Foreword of EN 60901 : 1990/A1 : 1990

The CENELEC Questionnaire Procedure, performed for finding out whether or not Amendment 1 to IEC 901 : 1987 could be accepted without textual changes, has shown that no CENELEC common modifications were necessary for the acceptance as an amendment to the European Standard. The reference document was submitted to the CENELEC members for formal vote.

The text was approved by CENELEC as Amendment 1 to EN 60901 : 1990 on 11 June 1990.

NOTE: The following subclauses are to be added to the list of subclauses applying to safety requirements given in the European Standard EN 60901:

- 2.1 Scope
- 2.2 Definitions

The following dates were fixed:

- latest date of announcement of the amendment at national level (doa) 1990-12-15
- latest date of publication of an identical amendment to the national standard (dop) 1991-06-15
- latest date of withdrawal of conflicting national standards (dow) 1991-06-15

Foreword of EN 60901 : 1990/A2 : 1993

The CENELEC Questionnaire Procedure, performed for finding out whether or not the Amendment 2 : 1992 to the International Standard IEC 901 : 1987 with its Corrigendum June 1992 could be accepted without textual changes, has shown that no common modifications were necessary for acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as Amendment A2 to EN 60901 : 1990 on 22 September 1993.

NOTE: The following subclauses are to added to the list of subclauses applying to safety requirements given in the European Standard EN 60901:

- 3.2 Definitions
- 3.3 Caps
- 3.8 Thermal conditions

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1994-10-01
- latest date of withdrawal
of conflicting national
standards (dow) 1994-10-01

For products which have complied with EN 60901 : 1990 and its Amendment A1 : 1990 before 1994-10-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-10-01.

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SINGLE-CAPPED FLUORESCENT LAMPS SAFETY AND PERFORMANCE REQUIREMENTS

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 34A: Lamps, of IEC Technical Committee No. 34: Lamps and related equipment.

The text of this standard is based on the following documents:

Six Months' Rule	Report on Voting	Two Months' Procedure	Report on Voting
34A(CO)281	34A(CO)319	34A(CO)324	34A(CO)339

Further information can be found in the relevant Reports on Voting indicated in the above table.

The following IEC publications are quoted in this standard:

Publications Nos.	61-1:	Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps.
	81 (1984):	Tubular fluorescent lamps for general lighting service.
	155 (1983):	Starters for tubular fluorescent lamps.
	598-1 (1986):	Luminaires – Part 1: General requirements and tests.
	921 (1988):	Ballasts for tubular fluorescent lamps – Performance requirements.

British Standard Specification for

Safety and performance of single-capped fluorescent lamps

SECTION ONE – GENERAL

1.1 Scope

This standard specifies the safety and performance requirements of a range of single-capped fluorescent lamps which are operated on a.c. supplies. The following types are included:—

- lamps with pre-heated cathodes operated with an integral means of starting;
- lamps with pre-heated cathodes operated with an external means of starting;
- lamps with pre-heated cathodes operated without the use of any starter.

The specific lamp types and requirements are listed in separate sections.

The safety and performance requirements of this standard relate only to type testing. Requirements for whole product testing or batch testing are under consideration.

Note. — Lamps which comply with this standard, when operated with a ballast complying with IEC Publication 82 and in a luminaire complying with IEC Publication 598-1, start and operate satisfactorily between 92% and 106% rated supply voltage and at an ambient air temperature of between 10 °C and 50 °C.

1.2 Definitions

1.2.1 *Single-capped fluorescent lamp*

Low-pressure mercury discharge lamp having a single cap in which most of the light from the lamp is emitted by a layer of fluorescent material excited by the ultra-violet radiation from the discharge.

1.2.2 *Rated wattage*

The wattage marked on the lamp. It is expressed in watts.

1.2.3 *Colour*

The colour characteristics of a lamp are defined by the colour appearance and the colour rendering.

- a) The actual colour of the lamp is called colour appearance and is defined in terms of the specific chromaticity co-ordinates according to the recommendations of the International Commission on Illumination (CIE).
- b) The effect which the spectral characteristics of the light emitted by the lamp have on the appearance of the objects illuminated by it is called colour rendering.

1.2.4 *Rated colour*

The colour appearance defined by the markings on the lamp.

Note. — For standard colours see Appendix D of IEC Publication 81.

Other colours declared by manufacturers are called special colours.

1.2.5 *Rated luminous flux*

The luminous flux marked on the lamp or declared as such by the supplier. It is expressed in lumens.

1.2.6 *Lumen maintenance*

The luminous flux at a given time in the life of a lamp divided by the initial value of the luminous flux of that lamp and expressed as a percentage of the initial luminous flux.

1.2.7 *Burn-in period*

The time required after switching on to reach stabilization of the vapour pressure within the discharge tube.

1.2.8 *Initial readings*

The measurement of the photometric and electrical characteristics made at the end of the 100 h ageing period and the checking of the starting voltages made before ageing.

1.2.9 *Type test*

A test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the standard.

1.2.10 *Type test sample*

A sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test.

1.2.11 *Group*

Lamps as represented by a single data sheet having the same rated electrical characteristics, the same physical dimensions and the same method of starting.

1.2.12 *Type*

Lamps of the same group having the same photometric ratings and colour characteristics.

1.2.13 *Batch*

All the lamps of one type put forward at one time for acceptance tests.

1.2.14 *Whole production*

The entire range of types manufactured over a period of 12 months for which a manufacturer requires certified approval, this list being incorporated in the certificate.

1.2.15 *Comparability test*

A test to check the consistency between the market sample and the manufacturer's own test data.

1.2.16 *Market sample*

A specified number of lamps selected by the test authority for the comparability test.

1.3 General principles of layout of data sheets

1.3.1 *Numbering system for lamp data sheets*

The first number represents the number of this standard "901" followed by the letters "IEC".

The second number is the lamp data sheet number.

The first figure of this number represents the section of this standard.

The second figure represents the range of the data sheets.

The third and fourth figures identify the individual data sheets.

The third number represents the edition of the page of the data sheet. In cases where a data sheet has more than one page it is possible for the pages to have different edition numbers with the data sheet number remaining the same.

1.4 Marking

The following information shall be distinctly and durably marked on the lamp:

- mark of origin. This may take the form of a trade mark, the manufacturer's mark or the name of the responsible vendor;
- rated wattage.

1.5 Glass tubing

The visible glass tubing of the lamp shall be free from defects detrimental to service.

1.6 Lamp dimensions

The lamp dimensions shall be those given on the relevant lamp data sheet.

1.7 Lamp caps

The requirements for lamp caps are given in IEC Publication 61-1.

SECTION 2 - LAMPS WITH PRE-HEATED CATHODES AND WITH AN INTEGRAL MEANS OF STARTING

2.1 Scope

This section specifies the safety and performance requirements which are in addition to those in Section 1, for a range of single-capped fluorescent lamps with pre-heated cathodes and with integral means of starting.

The list of specified lamp types and lamp data sheets is given in clause 2.11.

2.2 Definitions

2.2.1 single-capped fluorescent lamp with an integral means of starting: A low-pressure mercury discharge lamp having a single cap and an integral means of starting.

2.3 Caps

2.3.1 *For G23 caps the following applies:*

- a) For new lamps neither lamp bulb nor lamp cap shall be loosened by an axial pull of 40 N or a bending moment of 3 Nm. The pivot point lies in the cap reference plane (mating plane with the holder).
- b) Caps shall withstand, after the simulated endurance test, bending and pulling forces (requirements and test conditions are under consideration).
- c) At the end of life, the lamp cap shall show no damage impairing safety.

2.3.2 *For GR8 caps the following applies:*

Mechanical requirements are under consideration.

2.3.3 *For GX32d-capped fluorescent lamps the following applies:*

Introduction

For single-capped fluorescent lighting equipment the combination lamp/holder/ballast/luminaire shall provide adequate safety.

The most onerous situation with regard to temperature rise appears at the end of lamp-life, when the lamp does not start and a continuous current flows through the lamp electrode.

The maximum energy dissipated in the lamp electrode depends on the short-circuit current of the ballast. Therefore the lamp should not be connected to a ballast having a short-circuit current which is higher than the current for which the lamp has been designed.

To avoid unsafe situations of possible overheating, it is not sufficient to specify only the ballast/lamp combination. A non-interchangeability feature to avoid wrong combinations shall be introduced.

This feature has been introduced by designing different lamp(cap)/holder keys which are related to the maximum short-circuit current of the ballast.

For GX32d-capped fluorescent lamps the following table prescribes which lamp key should be used.

Guidance

- Lamp data sheets for GX32d-capped lamps shall provide information regarding the cap/holder keying system.
- Lamps intended to operate on a certain ballast shall be designed with the following keys:

Cap/ holder (designation / key)	Ballast (Maximum pre-heating current) (mA)
GX32d-1	650
GX32d-2	850
GX32d-3	1080
GX32d-4	–
GX32d-5	–

Any new key configuration should be approved by SC 34A.

2.4 Starting characteristics

2.4.1 Test conditions

Tests shall be made in still air at an ambient temperature between 20 °C and 27 °C in a relative humidity of 65 % maximum.

Metallic parts and wires in the vicinity of the lamp shall be avoided as far as possible.

The lamps shall be kept inoperative and in an ambient temperature of between 20 °C and 27 °C and a relative humidity of 65 % maximum, for a period of at least 24 h immediately prior to the starting test.

Lamps shall be tested with a 50 Hz or 60 Hz supply, in the circuit shown in figure 1, page F-2.

[IEC page II-4]

The ballast shall comply with the requirements of IEC Publication 921.

When, at its rated voltage, the ballast is associated with a lamp whose voltage at lamp terminals does not deviate by more than ± 2 % from the objective value specified on the relevant lamp data sheet, the lamp shall absorb a power which does not differ from its objective value by more than ± 4 %.

The voltage applied to the circuit shall be as specified on the relevant lamp data sheet.

2.4.2 *Starting time*

Lamps shall start fully within the time specified on the relevant lamp data sheet and remain alight.

2.5 **Electrical and photometric characteristics**

Before the lamps are measured for the first time, they shall be aged in the circuit shown in figure 2, page F-2, for a period of 100 h.

2.5.1 *Test conditions*

Tests shall be made in a draught-free atmosphere at the ambient temperature specified on the relevant lamp data sheet.

Lamps shall be tested in the position specified on the relevant data sheet.

Lamps shall be tested in the circuit shown in figure 3, page F-2.

Ballasts used for these tests shall be reference ballasts as specified in IEC Publication 921.

2.5.2 *Supply voltage*

a) *Frequency*

The frequency shall be that for which the ballast is designed, with a tolerance of $\pm 0,5$ %.

b) *Stabilization*

During periods of stabilization, the supply voltage shall be stable within $\pm 0,5$ %, this tolerance being reduced to $\pm 0,2$ % at the moment of measurement. The appropriate stabilization time is 15 min after the burn-in period as declared by the manufacturer or responsible vendor.

NOTE - During the shipping and normal handling of the lamps any excess amount of mercury may be distributed in small droplets within the discharge tube. Stabilization is reached when all the excess mercury has been collected at the coldest spot in the tube.

Experience shows that this process of collecting may take up to 15 h. When a lamp, once having passed the burn-in period, is re-lit within 24 h it will only need about 15 min for stabilizing, provided that the lamp has been kept in the same position and not subjected to vibration and shock.

c) *Harmonic content*

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

NOTE - This implies that the source of supply should have sufficient power and that the supply circuit should have a sufficiently low impedance compared with the ballast impedance. Care should be taken that this applies under all conditions that occur during the measurement.

2.5.3 *Instruments*

Instruments shall be essentially free from waveform errors. When measuring the voltage or power of the lamp, the potential circuit of the instruments shall be not less than 100 000 Ω and when not in use shall be disconnected. During the measuring of the lamp wattage, no correction shall be made for the wattmeter consumption (the circuit connection being made on the lamp side of the current coil).

When measuring the luminous flux, the potential circuits of the voltmeter and of the wattmeter shall be open.

2.5.4 *Lamp wattage and voltage*

The initial readings for the power dissipated by the lamp shall not differ from the objective wattage indicated on the relevant lamp data sheet by more than 5 % + 0,5 W.

The initial readings of the voltage at the lamp terminals shall comply with the value specified on the relevant lamp data sheet.

2.5.5 *Photometric characteristics*

- a) The initial readings for the luminous flux of the lamp shall be not less than 90 % of the rated value, which shall not be less than the value specified in the relevant lamp data sheet.
- b) The initial readings for the chromaticity colour co-ordinates of an individual lamp shall be within 5 SDCM (Standard Deviation of Colour Matching) of the rated values.

NOTE - See also appendix D of IEC Publication 81.

2.6 **Lumen maintenance**

2.6.1 *Test conditions*

Tests shall be made at an ambient temperature of between 20 °C and 30 °C. Excessive draughts shall be avoided and the lamps shall not be subjected to extreme vibration and shock.

Lamps shall be tested in the position specified on the relevant data sheet.

Lamps shall be tested in the circuit shown in figure 2, page F-2.

Ballasts used for these tests shall comply with the requirements of IEC Publication 921 and moreover with the following:

- a) When, at its rated voltage, the ballast is associated with a lamp whose voltage at lamp terminals does not deviate by more than ± 2 % from the objective value specified on the relevant lamp data sheet, the lamp shall absorb a power which does not differ from its objective value by more than ± 4 %.
- b) The pre-heating current, at rated voltage, shall not differ by more than ± 10 % from the nominal value specified on the relevant lamp data sheet.

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

Lamps on these tests shall be switched off for 15 min after each 2 h 45 min burning.

2.6.2 Requirements

Under consideration.

2.7 Thermal conditions

2.7.1 Maximum temperature rise of lamp cap

For lamps with G23 and GX23 caps:

The temperature rise, being the highest temperature of the insulating material on the outside of the lamp cap 8 mm from the reference plane of the cap in the direction of the tube, shall not exceed the value given on the relevant lamp data sheet under the following conditions:

- a) using a specially prepared de-activated lamp (end of life condition, de-activated cathode, starter contacts operating),
- b) in a draught-free atmosphere at the ambient temperature specified on the relevant lamp data sheet,
- c) in the position specified on the relevant lamp data sheet,
- d) on a 50 Hz reference ballast at 110 % rated supply voltage.

For lamps with GR8 caps:

Details are under consideration.

2.7.2 Power dissipation

Lamps with G23 and GX23 caps:

The power dissipation shall be not greater than the wattage given on the relevant lamp data sheet under the conditions specified in subclause 2.7.1.

Lamps with GR8 caps:

The test is not applicable.

2.8 Conditions of compliance

The conditions of compliance are under consideration.

2.9 Information for luminaire design

This information refers to checks necessary to ensure that conditions in the luminaire do not cause premature failure of lamps complying with this standard.

These checks do not constitute lamp requirements.

2.9.1 *Lamps with G23 and GX23 caps:*

a) *Normal operation – Cap temperature*

Under normal operation test conditions according to subclause 12.4.1 of IEC Publication 598-1 the temperature of the lamp cap measured at the bottom of the guide post shall not exceed the value indicated in table I.

Table 1

Lamp cap	Maximum temperature °C
G 23	90
GX23	90

NOTES

1 Explanation of the test conditions:

- Test lamps are production lamps with the lamp voltage, current and power within 2,5 % of the standardized objective value
- The test voltage for the luminaire is 1,06 times rated voltage.
- The ambient temperature in the test room is (25 ± 1) °C.

2 The temperature limitation under normal operation test conditions is necessary because of the presence of a radio interference capacitor built into the lamp cap.

b) *Abnormal operation – Heat test source temperature*

Under abnormal operation test conditions, according to subclause 12.5.1 of IEC Publication 598-1, luminaires for single-capped fluorescent lamps with G23 and GX23 caps shall be tested with the heat test source described in figure 4, page F-4.

The heat test simulates the end of life condition for a deactivated lamp with continuously switching starter and with cathodes passing nearly short-circuit current where maximum energy is dissipated through the central post and other parts of the lamp cap.

After the heat test source has thermally stabilized, the temperature on the measuring point of the heat test source shall not exceed the temperature marked on the heat test source.

NOTE - Explanation of the test conditions:

- Testing is carried out with a specially-made heat test source.
- The test voltage for the luminaire is 1,10 times rated supply voltage.
- The ambient temperature in the test room is $(25 \pm 1) ^\circ\text{C}$.
- The temperature limitation under abnormal operation test conditions is imposed by the lamp materials in order to guarantee safe removal of a defective lamp.

2.9.2 *Information on luminaire design for lamps with GR8 caps is under consideration.*

2.10 Diagrammatic data sheets

2.10.1 *List of diagrammatic data sheets*

901-IEC-2001 Diagrammatic drawing for location of lamp dimensions – dual-shaped.

901-IEC-2002 Diagrammatic drawing for location of lamp dimensions – square-shaped.

2.11 Lamp data sheets

2.11.1 *List of specific lamp types*

Sheet No.	Lamp rating	Cap
901-IEC-2105-	5 W	G23
901-IEC-2107-	7 W	G23
901-IEC-2109-	9 W	G23
901-IEC-2111-	11 W	G23
901-IEC-2113-	13 W	GX23
901-IEC-2116-	16 W	GR8
901-IEC-2228-	28 W	GR8

2.12 Maximum lamp outlines

These are provided for the guidance of designers of luminaires and are based on a maximum sized lamp inclusive of bulb to cap displacement.

Observance of these requirements in luminaire design will ensure mechanical acceptance of lamps complying with this standard.

2.12.1 *List of maximum lamp outlines*

Sheet No.	Lamp rating	Cap
901-IEC-2905-	5 W	G23
901-IEC-2907-	7 W	G23
901-IEC-2909-	9 W	G23
901-IEC-2911-	11 W	G23
901-IEC-2913-	13 W	GX23
901-IEC-2916-	16 W	GR8
901-IEC-2928-	28 W	GR8

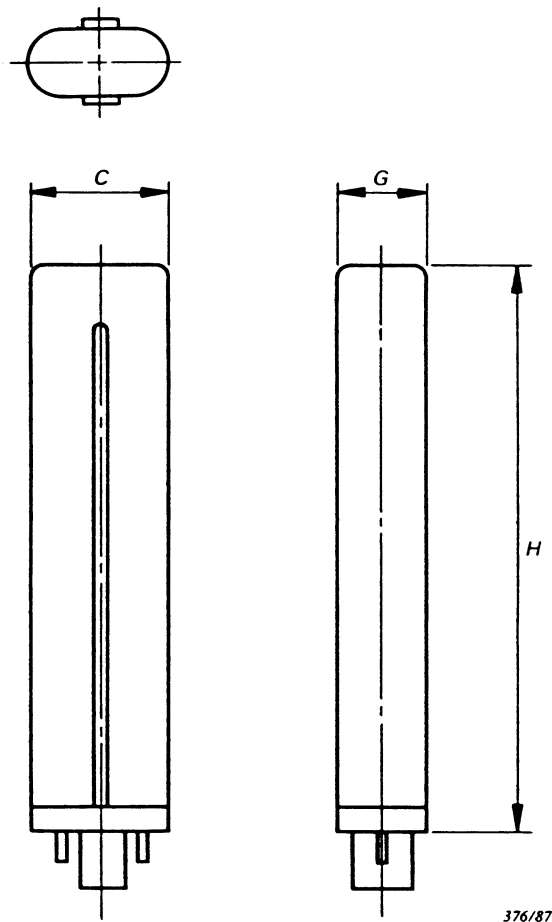
**DIAGRAMMATIC DATA SHEET
FOR LOCATION OF SINGLE-CAPPED
FLUORESCENT LAMP DIMENSIONS**

Integral means of starting

Dual-shaped

These drawings are intended only to indicate dimensions to be controlled and are to be used in conjunction with the relevant lamp standard sheets.

G23 and GX23 caps*



NOTES

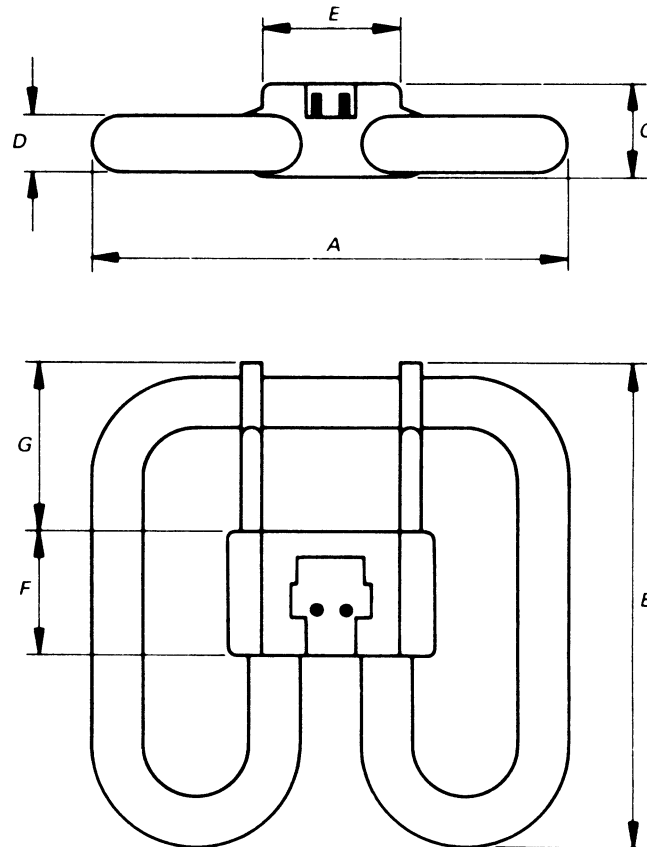
- 1 Dimensions *C* and *G* refer to the glass parts of the lamp.
- 2 Maximum lamp outlines are given in clause 2.12.

* See sheets 7004-69 and 7004-86 of IEC Publication 61-1.

	DIAGRAMMATIC DATA SHEET FOR LOCATION OF SINGLE-CAPPED FLUORESCENT LAMP DIMENSIONS Integral means of starting	Square-shaped
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These drawings are intended only to indicate dimensions to be controlled and are to be used in conjunction with the relevant lamp standard sheets.

GR8 Cap*



Note. – Maximum lamp outlines are given in Clause 2.12.

* See Sheet 7004-68- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET			Page 1
Integral means of starting		Dual-shaped	

Rating	Circuit	Cap	Nominal dimensions
5 W	Internal starter	G23	105 mm x 30 mm x 15 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, clause 2.8 applies.

Lamp dimensions (mm) – See sheet 901-IEC-2001-			
<i>H</i>		<i>C</i>	<i>G</i>
Max.	Min.	Max.	Max.
85	*	28	13

Lamp starting test			
Frequency (Hz)	Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
50	198	220	10
60	106	118	10

Initial readings and colour

For electrical and photometric characteristics, clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	5	5,4	34	39	29	0,180	0,190
60	5	5,5	35	40	30	0,180	0,190

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See sheet 7004-69- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET

Integral means of starting

Dual-shaped

Page 2

Lumen maintenance test

For lumen maintenance, clause 2.6 applies. Lamps shall be tested in a vertical cap-up position. For conditions of compliance, clause 2.8 applies.

Minimum lumen maintenance (%)	
at 2 000 h	at 70 % of rated life
*	*

Ballast characteristics

The requirements of IEC Publication 921 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage / current ratio (Ω)	Power factor
50	9	220	0,170	1180	0,12
60	5,5	118	0,180	605	0,075

Information for ballast design				
Open-circuit voltage (V)			Pre-heating current (A)	
Frequency (Hz)	Min (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
50	198	400	0,153	0,240
60	108	400	0,153	0,240
Maximum lamp operating current ratio (%)			Equivalent resistance of both cathodes in series (Ω)	
105			160	

Thermal conditions

For thermal conditions, clause 2.7 applies.

Power dissipation (W max.)	7,5
Cap temperature rise (K max.)	75

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET			
Integral means of starting		Dual-shaped	
Page 1			

Rating	Circuit	Cap	Nominal dimensions
7 W	Internal starter	G23	135 mm × 30 mm × 15 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, clause 2.8 applies.

Lamp dimensions (mm) – See sheet 901-IEC-2001-			
H		C	G
Max.	Min.	Max.	Max.
115	*	28	13

Lamp starting test			
Frequency (Hz)	Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
50	198	220	10
60	106	118	10

Initial readings and colour

For electrical and photometric characteristics, clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	7	6,9	45	50	40	0,180	0,190
60	7	7	45	50	40	0,180	0,190

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See sheet 7004-69- of IEC Publication 61-1.

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SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET

Integral means of starting

Dual-shaped

Page 2

Lumen maintenance test

For lumen maintenance, clause 2.6 applies. Lamps shall be tested in a vertical cap-up position. For conditions of compliance, clause 2.8 applies.

Minimum lumen maintenance (%)	
at 2 000 h	at 70 % of rated life
*	*

Ballast characteristics

The requirements of IEC Publication 921 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage / current ratio (Ω)	Power factor
50	9	220	0,170	1180	0,12
60	7	118	0,180	570	0,075

Information for ballast design				
Open-circuit voltage (V)			Pre-heating current (A)	
Frequency (Hz)	Min (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
50	198	400	0,153	0,240
60	108	400	0,153	0,240
Maximum lamp operating current ratio (%)			Equivalent resistance of both cathodes in series (Ω)	
105			160	

Thermal conditions

For thermal conditions, clause 2.7 applies.

Power dissipation (W max.)	7,5
Cap temperature rise (K max.)	76*

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET		
Integral means of starting	Dual-shaped	Page 1

Rating	Circuit	Cap	Nominal dimensions
9 W	Internal starter	G23	170 mm x 30 mm x 15 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, clause 2.8 applies.

Lamp dimensions (mm) – See sheet 901-IEC-2001-			
<i>H</i>		<i>C</i>	<i>G</i>
Max.	Min.	Max.	Max.
145	*	28	13

Lamp starting test			
Frequency (Hz)	Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
50	198	220	10
60	106	118	10

Initial readings and colour

For electrical and photometric characteristics, clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	9	8,7	60	66	54	0,170	0,190
60	9	9	59	65	53	0,180	0,190

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See sheet 7004-69- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET

Integral means of starting

Dual-shaped

Page 2

Lumen maintenance test

For lumen maintenance, clause 2.6 applies. Lamps shall be tested in a vertical cap-up position. For conditions of compliance, clause 2.8 applies.

Minimum lumen maintenance (%)	
at 2 000 h	at 70 % of rated life
*	*

Ballast characteristics

The requirements of IEC Publication 921 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage / current ratio (Ω)	Power factor
50	9	220	0,170	1180	0,12
60	9	118	0,180	515	0,075

Information for ballast design				
Open-circuit voltage (V)			Pre-heating current (A)	
Frequency (Hz)	Min. (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
50	198	400	0,153	0,240
60	108	400	0,153	0,240
Maximum lamp operating current ratio (%)			Equivalent resistance of both cathodes in series (Ω)	
105			160	

Thermal conditions

For thermal conditions, clause 2.7 applies.

Power dissipation (W max.)	7,5
Cap temperature rise (K max.)	76*

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET		
Integral means of starting		Dual-shaped
		Page 1

Rating	Circuit	Cap	Nominal dimensions
11 W	Internal starter	G23	240 mm × 30 mm × 15 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, clause 2.8 applies.

Lamp dimensions (mm) – See sheet 901-IEC-2001-			
<i>H</i>		<i>C</i>	<i>G</i>
Max.	Min.	Max.	Max.
215	*	28	13

Lamp starting test		
Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
198	220	10

Initial readings and colour

For electrical and photometric characteristics, clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	11	11,4	90	99	81	0,155	0,190

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See sheet 7004-69- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET

Integral means of starting

Dual-shaped

Page 2

Lumen maintenance test

For lumen maintenance, clause 2.6 applies. Lamps shall be tested in a vertical cap-up position. For conditions of compliance, clause 2.8 applies.

Minimum lumen maintenance (%)	
at 2 000 h	at 70 % of rated life
*	*

Ballast characteristics

The requirements of IEC Publication 921 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage / current ratio (Ω)	Power factor
50	9	220	0,170	1180	0,12

Information for ballast design			
Open-circuit voltage (V)		Pre-heating current (A)	
Min. (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
198	400	0,153	0,240
Maximum lamp operating current ratio (%)		Equivalent resistance of both cathodes in series (Ω)	
105		160	

Thermal conditions

For thermal conditions, clause 2.7 applies.

Power dissipation (W max.)	7,5
Cap temperature rise (K max.)	76 *

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET			
Integral means of starting		Dual-shaped	Page 1

Rating	Circuit	Cap	Nominal dimensions
13 W	Internal starter	GX23	190 mm x 30 mm x 15 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, clause 2.8 applies.

Lamp dimensions (mm) – See sheet 901-IEC-2001-			
H		C	G
Max.	Min.	Max.	Max.
170	*	28	13

Lamp starting test		
Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
106	118	10

Initial readings and colour

For electrical and photometric characteristics, clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
60	13	13,4	59	65	53	0,285	0,400

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See sheet 7004-86- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET

Integral means of starting

Dual-shaped

Page 2

Lumen maintenance test

For lumen maintenance, clause 2.6 applies. Lamps shall be tested in a vertical cap-up position. For conditions of compliance, clause 2.8 applies.

Minimum lumen maintenance (%)	
at 2 000 h	at 70 % of rated life
*	*

Ballast characteristics

The requirements of IEC Publication 921 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage / current ratio (Ω)	Power factor
60	13	118	0,285	325	0,075

Information for ballast design			
Open-circuit voltage (V)		Pre-heating current (A)	
Min. (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
106	400	0,270	0,525
Maximum lamp operating current ratio (%)		Equivalent resistance of both cathodes in series (Ω)	
105		25	

Thermal conditions

For thermal conditions, clause 2.7 applies.

Power dissipation (W max.)	*
Cap temperature rise (K max.)	76*

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET
Integral means of starting **Square-shaped**

Page 1

Rating	Circuit	Cap	Nominal dimensions
16 W	Internal starter	GR8	140 mm × 140 mm × 27 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, Clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, Clause 2.8 applies.

Lamp dimensions (mm) — See Sheet 901-IEC-2002-							
A	B	C	D	E	F	G	
Max.	Max.	Max.	Max.	Max.	Max.	Max.	Min.
138	141	27.5	15	41	37	51	49

Lamp starting test		
Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
198	220	10

Initial readings and colour

For electrical and photometric characteristics, Clause 2.5 applies. Lamps shall be tested in a vertical cap-up position at an ambient temperature of * °C. For conditions of compliance, Clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	16	16	103	113	93	0.195	0.26

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
980	*

* Under consideration.

Cap

See Sheet 7004-68- of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET
Integral means of starting **Square-shaped**

Page 2

Lumen maintenance

For lumen maintenance test, Clause 2.6 applies. Lamps shall be tested in a cap-up position. For conditions of compliance, Clause 2.8 applies.

Minimum lumen maintenance (%)	
2 000 h	70% life
75%	70%

Ballast characteristics

The requirements of IEC Publication 82 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage/ current ratio (Ω)	Power factor
50	16	220	0.20	890	0.12

Information for ballast design			
Open circuit voltage (V)		Pre-heating current (A)	
Min. (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
198	400	0.175	0.41
Max. (r.m.s.) voltage across lamp terminals with lamp operating (V)		Equivalent resistance of both cathodes in series (Ω)	
130		130	

Thermal conditions*

* Under consideration.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET
Integral means of starting **Square-shaped**

Page 1

Rating	Circuit	Cap	Nominal dimensions
28 W	Internal starter	GR8	205 mm × 205 mm × 35 mm

Mechanical, physical and starting requirements

For lamp marking, tubes, dimensions, caps and starting requirements, Clauses 1.4 to 1.7 and 2.4 apply. For conditions of compliance, Clause 2.8 applies.

Lamp dimensions (mm) — See Sheet 901-IEC-2002-1							
A	B	C	D	E	F	G	
Max.	Max.	Max.	Max.	Max.	Max.	Max.	Min.
205	207	33	24	41	47	77	74

Lamp starting test		
Test voltage (V)	Ballast voltage rating (V)	Starting time (s)
198	220	10

Initial readings and colour

For electrical and photometric characteristics, Clause 2.5 applies. Lamps shall be tested in a vertical cap up position at an ambient temperature of * °C. For conditions of compliance, Clause 2.8 applies.

Lamp electrical characteristics							
Frequency (Hz)	Rated wattage (W)	Objective wattage (W)	Voltage (r.m.s.) at lamp terminals (V)			Nominal current (A)	
			Objective	Max.	Min.	Running	Pre-heat
50	28	28	107	117	97	0.325	0.41

Luminous and colour characteristics	
Minimum rated luminous flux, in lumens	Chromaticity co-ordinates
*	*

* Under consideration.

Cap

See Sheet 7004-68 of IEC Publication 61-1.

SINGLE-CAPPED FLUORESCENT LAMP DATA SHEET
Integral means of starting **Square-shaped**

Page 2

Lumen maintenance

For lumen maintenance test, Clause 2.6 applies. Lamps shall be tested in a cap-up position. For conditions of compliance, Clause 2.8 applies.

Minimum lumen maintenance (%)	
2 000 h	70% life
*	*

Ballast characteristics

The requirements of IEC Publication 82 apply.

Reference ballast characteristics					
Frequency (Hz)	Rated wattage (W)	Rated voltage (V)	Calibration current (A)	Voltage/ current ratio (Ω)	Power factor
50	28**	210	0.325	480	0.10

** A 220 V/30 W rated reference ballast may be used provided it complies with Clause C3 of Appendix C of IEC Publication 82.

Information for ballast design			
Open circuit voltage (V)		Pre-heating current (A)	
Min. (r.m.s.) at lamp	Max. (peak) at lamp	Min.	Max.
198	400	0.29	0.68
Max. (r.m.s.) voltage across lamp terminals with lamp operating (V)		Equivalent resistance of both cathodes in series (Ω)	
130		50	

Thermal conditions*

* Under consideration.

	MAXIMUM LAMP OUTLINE 5 W SINGLE-CAPPED FLUORESCENT LAMP G23 CAP Integral means of starting Dual-shaped	
Dimensions in millimetres The drawing shows two views of a fluorescent lamp. The front view on the left has a top width of 32,5 mm, a base width of 34,0 mm, and a base height of 30 mm. The side view on the right has a top width of 18,1 mm, a total height of 85 mm, and a base width of 19,5 mm. A reference number 862/88 is located below the side view.		
901-IEC-2905-2  Documents Document Sharing Hub Publication CEI 901 IEC Publication 901		