

© Copyright SEK. Reproduction in any form without permission is prohibited.

Belysningsmateriel – Elektroniska förkopplingsdon för lysrör – Prestandafordringar

*AC and/or DC-supplied electronic control gear for tubular fluorescent lamps –
Performance requirements*

Som svensk standard gäller europastandarden EN 60929:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60929:2011.

Nationellt förord

Europastandarden EN 60929:2011

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60929, Fourth edition, 2011 - AC and/or DC-supplied electronic control gear for tubular fluorescent lamps - Performance requirements**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60929, utgåva 3, 2006, gäller ej fr o m 2014-06-23.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English version

**AC and/or DC-supplied electronic control gear for tubular fluorescent lamps -
Performance requirements
(IEC 60929:2011)**

Appareillages électroniques alimentés en
courant alternatif et/ou continu pour
lampes tubulaires à fluorescence -
Exigences de performances
(CEI 60929:2011)

Wechsel- und/oder gleichstromversorgte
elektronische Betriebsgeräte für
röhrenförmige Leuchtstofflampen -
Anforderungen an die Arbeitsweise
(IEC 60929:2011)

This European Standard was approved by CENELEC on 2011-06-23. 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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 34C/963/FDIS, future edition 4 of IEC 60929, 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 60929 on 2011-06-23.

This European Standard supersedes EN 60929:2006 + corr. Dec.2006.

The essential change with respect to EN 60929:2006 + corr. Dec.2006 is the extension to DC supplied control gear and the deletion of the requirements for digital signal control of electronic control gear.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) | 2012-03-23 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-06-23 |

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

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60929:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61000-3-2	NOTE Harmonized as EN 61000-3-2.
IEC 61000-4-30	NOTE Harmonized as EN 61000-4-30.
IEC 61547	NOTE Harmonized as EN 61547

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 60081	1997	Double-capped fluorescent lamps -	EN 60081	1998
+ A1 (mod)	2000	Performance specifications	+ A1	2002
+ A2	2003		+ A2	2003
+ A3	2005		+ A3	2005
+ A4	2010		+ A4	2010
IEC 60901	1996	Single-capped fluorescent lamps -	EN 60901	1996
+ A1	1997	Performance specifications	+ A1	1997
+ A2	2000		+ corr. October	1997
+ A3	2004		+ A2	2000
+ A4	2007		+ A3	2004
			+ A4	2008
IEC 61347-1 (mod)	2007	Lamp controlgear - Part 1: General and safety requirements	EN 61347-1	2008
IEC 61347-2-3	2000	Lamp controlgear -	EN 61347-2-3	2001
+ A1	2004	Part 2-3: Particular requirements for a.c.	+ corr. July	2003
+ A2	2006	supplied electronic ballasts for fluorescent lamps	+ corr. December	2010
			+ A1	2004
			+ A2	2006
IEC 62386	Series	Digital addressable lighting interface	EN 62386	Series

CONTENTS

INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 General notes on tests	9
5 Marking	10
5.1 Mandatory marking.....	10
5.2 Additional mandatory Information	10
5.3 Non-mandatory information	10
6 General statement.....	11
7 Starting conditions.....	11
7.1 General.....	11
7.2 Conditions for control gear with preheating.....	11
7.2.1 General	11
7.2.2 Preheat energy.....	11
7.2.3 Open-circuit voltage	12
7.3 Conditions for control gear without preheating.....	13
7.3.1 General	13
7.3.2 Open-circuit voltage	13
7.3.3 Control gear impedance test.....	13
7.3.4 Cathode current.....	13
7.4 Starting aid and distances	14
8 Operating conditions	14
8.1 Ballast lumen factor.....	14
8.2 Total circuit power	14
8.3 Requirements for dimming.....	14
8.3.1 Lamp cathode heating	14
8.3.2 Control interfaces	14
8.4 Current limitation.....	14
9 Circuit power factor	14
10 Supply current.....	15
11 Maximum current in any lead to a cathode.....	15
12 Lamp operating current waveform.....	15
13 Impedance at audio frequencies	15
14 Operational tests for abnormal conditions.....	16
14.1 Removal of lamp(s)	16
14.2 Lamp fails to start.....	16
14.3 Control gear behaviour close to end of lamp life	16
15 Endurance.....	16
15.1 General.....	16
15.2 Temperature cycling	16
15.3 Test at $t_c + 10$ K.....	17
Annex A (normative) Tests.....	21
Annex B (normative) Reference ballasts	26

Annex C (normative) Conditions for reference lamps	30
Annex D (informative) Explanation of starting conditions.....	31
Annex E (normative) Control interface for controllable control gear	35
Bibliography.....	40
Figure 1 – Schematic illustration of the energy required for preheating and starting	18
Figure 2 – Test circuits for non-preheat starting mode	20
Figure A.1 – Measurement of impedance at audio frequencies.....	24
Figure A.2 – Test circuit for control gear for preheat starting mode	25
Figure B.1 – HF reference circuit	29
Figure E.1 – Functional specification for d.c. voltage control.....	35
Figure E.2 – Connection diagram for several controllable control gear	36
Figure E.3 – Circuit diagram with current sourcing	36
Figure E.4 – Functional specification for PWM control	37
Figure E.5 – PWM signal characteristics	37
Figure E.6 – Connecting diagram for PWM controllable control gear	38
Figure E.7 – Dimming curve for controllable control gear	39
Table 1 – Control gear life time information.....	10

INTRODUCTION

This International Standard covers performance requirements for electronic control gear for use on a.c., at 50 Hz or 60 Hz, and/or d.c. supplies up to 1 000 V with operating frequencies deviating from the supply frequency, associated with tubular fluorescent lamps as specified in IEC 60081 and IEC 60901, and other tubular fluorescent lamps for high frequency operation, still to be standardised.

These control gear are intended to operate lamps at various frequencies including high frequencies and at various lamp powers. Attention is drawn to the fact that operating frequencies below 20 kHz may cause audio noise disturbance, whereas frequencies above 50 kHz may increase radio interference problems.

Some lamps may be specifically designed for high-frequency operation on high-frequency control gear. Two starting modes, preheat and non-preheat, are described.

NOTE Lamps, only specified for preheat starting may be operated on other types of circuits. The control gear manufacturer should provide test data which shows satisfactory starting and operation similar as the ones stated in Clause 6.

In order to obtain satisfactory performance of fluorescent lamps and electronic control gears, it is necessary that certain features of their design be properly co-ordinated. It is essential, therefore, that specifications for them be written in terms of measurement made against some common baseline of reference, permanent and reproducible.

These conditions may be fulfilled by reference ballasts. Moreover, the testing of control gear for fluorescent lamps will, in general, be made with reference lamps and, in particular, by comparing results obtained on such lamps with control gear to be tested and with reference ballast.

Whereas the reference ballast for frequencies of 50 Hz or 60 Hz is a self-inductive coil, the high-frequency reference ballast is a resistor because of its independence of frequency and the lack of influence of parasitic capacitance.

AC and/or DC-SUPPLIED ELECTRONIC CONTROL GEAR FOR TUBULAR FLUORESCENT LAMPS – PERFORMANCE REQUIREMENTS

1 Scope

This international Standard specifies performance requirements for electronic control gear for use on a.c. at 50 Hz or 60 Hz and/or d.c. supplies, both up to 1 000 V, with operating frequencies deviating from the supply frequency, associated with fluorescent lamps as specified in IEC 60081 and IEC 60901, and other fluorescent lamps for high-frequency operation.

NOTE 1 Tests in this standard are type tests. Requirements for testing individual control gear during production are not included.

NOTE 2 There are regional standards regarding the regulation of mains current harmonics and immunity for end-products like luminaires and independent control gear. In a luminaire, the control gear is dominant in this respect. Control gear, together with other components, should comply with these standards.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60081:1997, *Double-capped fluorescent lamps – Performance specifications*
Amendment 1(2000)
Amendment 2 (2003)
Amendment 3 (2005)
Amendment 4 (2010)

IEC 60901:1996, *Single-capped fluorescent lamps – Performance specifications*
Amendment 1(1997)
Amendment 2 (2000)
Amendment 3 (2004)
Amendment 4 (2007)

IEC 61347-1:2007, *Lamp controlgear – Part 1: General and safety requirements*
Amendment 1(2010)¹

IEC 61347-2-3:2000, *Lamp controlgear – Part 2-3: Particular requirements for a.c. supplied electronic ballasts for fluorescent lamps*
Amendment 1(2004)
Amendment 2 (2006)

IEC 62386 (all parts), *Digital addressable lighting*

¹ There exists a consolidated edition 2.1 (2010) that comprises IEC 61347-1:2007 and its Amendment 1 (2010).