

Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

The European Standard EN 55015:2000, with the incorporation of amendment A1:2001 and A2:2002, has the status of a British Standard

ICS 29.140.01; 33.100.10

National foreword

This British Standard is the official English language version of EN 55015:2000, including amendment A1:2001 and amendment A2:2002. It is identical with CISPR 15:2000 including amendment 1:2001 and 2:2002. It supersedes BS EN 55015:1996 which will be withdrawn on 2003-08-01

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, EMC policy, to Subcommittee GEL/210/11, EMC products, which has the responsibility to:

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 15 March 2001

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 46, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
13716	4 July 2002	See national foreword
14024 Corrigendum No. 1	16 August 2002	Correction to the incorporation of Amendment No. 1
14943	19 February 2004	See national foreword

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ISBN 0 580 36888 2

English version

Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

(includes amendment A1:2001 and A2:2002)
(CISPR 15:2000)

Limites et méthodes de mesure des perturbations radioélectriques produites par les appareils électriques d'éclairage et les appareils analogues (inclut l'amendement A1:2001 et A2:2002) (CISPR 15:2000)

Grenzwerte und Messverfahren für die Funkstöreigenschaften von elektrischen Beleuchtungsanlagen und ähnlichen Elektorgerten (enthält Änderung A1:2001 und A2:2002) (CISPR 15:2000)

This European Standard was approved by CENELEC on 2000-08-01. Amendment A1 was approved by CENELEC on 2001-12-01. Amendment 2 was approved by CENELEC on 2002-10-01. 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.

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

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 CISPR/F/303/FDIS, future edition 6 of CISPR 15, prepared by CISPR SC F, Interference relating to household appliances, tools lighting equipment and similar apparatus, was submitted to the IEC-CENELEC as EN 55015 on 2000-08-01.

This European Standard supersedes EN 55015:1996 and its amendments A1:1997 and A2:1999.

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) 2001-05-01
- latest date by which the national standards conflicting with EN have to be withdrawn (dow) 2003-08-01

Annexes designated “normative” are part of the body of the standard.
In this standard, annexes A and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard CISPR 15:2000 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document CISPR/F/337/FDIS, future amendment 1 to CISPR 15:2000, prepared by CISPR SC F, Interference relating to household appliances, tools lighting equipment and similar apparatus, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 55015:2000 on 2001-12-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-09-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2004-12-01

Annexes designated “normative” are part of the body of the standard.
In this amendment, Annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2001 to the International Standard CISPR 15:2000 was approved by CENELEC as an amendment to the European Standard without any modification.

Foreword to amendment A2

The text of document CISPR/F/356/FDIS, future amendment 2 to CISPR 15:2000, prepared by CISPR SC F, Interference relating to household appliances, tools, lighting equipment and similar apparatus, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 55015:2000 on 2002-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-10-01

Endorsement notice

The text of amendment 2:2002 to the International Standard CISPR 15:2000 was approved by CENELEC as an amendment to the European Standard without any modification.

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LIMITS AND METHODS OF MEASUREMENT OF RADIO DISTURBANCE CHARACTERISTICS OF ELECTRICAL LIGHTING AND SIMILAR EQUIPMENT

1 Scope

This standard applies to the emission (radiated and conducted) of radiofrequency disturbances from:

- all lighting equipment with a primary function of generating and/or distributing light intended for illumination purposes, and intended either for connection to the low voltage electricity supply or for battery operation;
- the lighting part of multi-function equipment where one of the primary functions of this is illumination;
- independent auxiliaries exclusively for use with lighting equipment;
- UV and IR radiation equipment;
- neon advertising signs;
- street/flood lighting intended for outdoor use;
- transport lighting (installed in buses and trains).

Excluded from the scope of this standard are:

- lighting equipment operating in the ISM frequency bands (as defined in Resolution 63 (1979) of the ITU Radio Regulation);
- lighting equipment for aircraft and airports;
- apparatus for which the electromagnetic compatibility requirements in the radio-frequency range are explicitly formulated in other IEC or CISPR standards.

NOTE – Examples are:

NOTE – built-in lighting devices in other equipment, for example scale illumination or neon devices;

NOTE – photocopiers;

NOTE – slide projectors;

NOTE – lighting equipment for road vehicles.

The frequency range covered is 9 kHz to 400 GHz.

Multi-function equipment which is subjected simultaneously to different clauses of this standard and/or other standards shall meet the provisions of each clause/standard with the relevant functions in operation.

The limits in this standard have been determined on a probabilistic basis to keep the suppression of disturbances within economically reasonable limits while still achieving an adequate level of radio protection and electromagnetic compatibility. In exceptional cases, additional provisions may be required.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60155:1993, *Glow-starters for fluorescent lamps*

IEC 60598: *Luminaires*

CISPR 11:1997, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

CISPR 16-1:1999, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

 CISPR 16-2:1996, *Specification for radio disturbance and immunity measuring apparatus and methods — Part 2: Methods of measurement of disturbances and immunity*

CISPR 22:1997, *Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement* 

3 Definitions

For the purpose of this International Standard, the definitions contained in IEC 60050(161) apply.

Continuous disturbance may be either broadband, for instance caused by the switching operations or by unstable gas-discharges in the lamp electrode region, or may be narrowband, for instance caused by electronic control devices operating at dedicated frequencies.

NOTE Instead of the concept of "broadband" and "narrowband", a distinction is made in this standard between two related kinds of disturbance, defined by the type of the applied detector. For this purpose, limits have been defined with respect to the measurement with the quasi-peak detector and with the average detector. By using this approach, a combination of broadband and narrowband disturbances can also be assessed.

4 Limits

4.1 Frequency ranges

In 4.2, 4.3 and 4.4, limits are given as a function of frequency range. No measurements need to be performed at frequencies where no limits are specified.

NOTE The World Administrative Radiocommunications Conference (WARC) has in 1979 reduced the lower frequency limit in region 1 to 148,5 kHz; for applications falling within the scope of this standard, tests at 150 kHz are considered adequate, since 148,5 kHz falls within the receiver bandwidth.

4.2 Insertion loss

The minimum values of the insertion loss for the frequency range 150 kHz to 1 605 kHz are given in table 1.

Table 1 – Minimum values of insertion loss

Frequency range kHz	Minimum values dB
150 to 160	28
160 to 1 400	28 to 20*
1 400 to 1 605	20
* Decreasing linearly with the logarithm of frequency.	

4.3 Disturbance voltages

4.3.1 Mains terminals

The limits of the mains terminal disturbance voltages for the frequency range 9 kHz to 30 MHz are given in table 2a.

Table 2a – Disturbance voltage limits at mains terminals

Frequency range	Limits dB(μV)*	
	Quasi-peak	Average
9 kHz to 50 kHz**	110	—
50 kHz to 150 kHz**	90 to 80***	—
150 kHz to 0,5 MHz	66 to 56***	56 to 46***
0,5 MHz to 2,51 MHz	56	46
2,51 MHz to 3,0 MHz	73	63
3,0 MHz to 5,0 MHz	56	46
5 MHz to 30 MHz	60	50
* At the transition frequency, the lower limit applies. ** The limit values in the frequency range 9 kHz to 150 kHz are considered to be "provisional limits" which may be modified after some years of experience. *** The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.		
NOTE In Japan, the limits in the frequency range 9 kHz to 150 kHz are not applicable. Moreover, the limits 56 dB(μV) quasi-peak and 46 dB(μV) average apply between 2,51 MHz and 3 MHz.		



4.3.2 Load terminals

The limits of the load terminal disturbance voltage for the frequency range 150 kHz to 30 MHz are given in table 2b.

Table 2b – Disturbance voltage limits at load terminals

Frequency range MHz	Limits dB(μV)*	
	Quasi-peak	Average
0,15 to 0,50	80	70
0,50 to 30	74	64
* At the transition frequency, the lower limit applies.		



4.3.3 Control terminals

The limits of the control terminal disturbance voltage for the frequency range 150 kHz to 30 MHz are given in table 2c.

Table 2c – Disturbance voltage limits at control terminals

Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	84 to 74	74 to 64
0,50 to 30	74	64
NOTE 1 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.		
NOTE 2 The voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the control terminal.		



4.4 Radiated electromagnetic disturbances

The quasi-peak limits of the magnetic component of the radiated disturbance field strength in the frequency range 9 kHz to 30 MHz, measured as a current in 2 m, 3 m or 4 m loop antennas around the lighting equipment, are given in table 3.

The limits for the 2 m loop diameter apply to equipment not exceeding a length of 1,6 m, those for the 3 m loop diameter for equipment having a length in between 1,6 m and 2,6 m and those for the 4 m loop diameter for equipment having a length in between 2,6 m and 3,6 m.

Table 3 – Radiated electromagnetic disturbance limits

Frequency range MHz	Limits for loop diameter dB(μA)*		
	2 m	3 m	4 m
9 kHz to 70 kHz	88	81	75
70 kHz to 150 kHz	88 to 58**	81 to 51**	75 to 45**
150 kHz to 2,2 MHz	58 to 26**	51 to 22**	45 to 16**
2,2 MHz to 3,0 MHz	58	51	45
3,0 MHz to 30 MHz	22	15 to 16***	9 to 12***
NOTE * At the transition frequency, the lower limit applies.			
NOTE ** Decreasing linearly with the logarithm of the frequency.			
NOTE *** Increasing linearly with the logarithm of the frequency.			
NOTE NOTE In Japan, the limits for frequencies 9 kHz to 150 kHz do not apply.			

5 Application of the limits

5.1 General

Applications of the limits for the various kinds of lighting equipment as mentioned in the scope of this standard are given in 5.2 to 5.10.

No emission requirements apply to lamps other than self-ballasted lamps nor to auxiliaries incorporated in luminaires, in self-ballasted lamps or in semi-luminaires. (See, however, note 2 of 5.3.1 in this respect.)

The disturbance caused by manual or automatic operation of a switch (external or included in equipment) to connect or disconnect the mains shall be disregarded. This includes manual on/off switches or, for example, switches activated by sensors or ripple control receivers. However, switches which will be repeatedly operated (e.g. such as those of advertising signs) are not included in this exception.

5.2 Indoor luminaires

5.2.1 General

The following conditions apply to all kinds of indoor luminaires irrespective of the environment in which they are used.

5.2.2 Incandescent lamp luminaires

Incandescent lamp luminaires where the lamps are a.c. mains or d.c. operated, or which do not incorporate a light regulating device or electronic switch, are not expected to produce electromagnetic disturbances. Therefore, they are deemed to fulfil all relevant requirements of this standard without further testing.

NOTE Where, in this standard, the term "incandescent lamp" is used, all types of incandescent lamps including halogen lamps are meant.

5.2.3 Fluorescent lamp luminaires

The minimum values of insertion loss of table 1 shall apply where a fluorescent lamp luminaire is a starter switch operated type and designed for one of the following lamp types:

- linear fluorescent lamps with a nominal diameter of 15 mm, 25 mm or 38 mm;
- circular fluorescent lamps with a nominal diameter of 28 mm or 32 mm;
- U-type fluorescent lamps with a nominal diameter of 15 mm, 25 mm or 38 mm;
- single-capped fluorescent lamps, without integrated starter and with a nominal diameter of 15 mm;
- single-capped fluorescent lamps, linear shaped, twin and quad tube, with integrated starter and having a nominal tube diameter of 12 mm.

5.2.4 Other luminaires

Indoor luminaires other than described in 5.2.2 or 5.2.3 shall comply with the mains terminal voltage limits given in table 2a.

Where the luminaire supplies the lamp(s) with a current having an operation frequency in excess of 100 Hz, it shall comply with the radiated disturbance limits given in table 3.

[A1] Where the light output of the luminaire is regulated by an external device with separate control lines, the disturbance voltage at the control terminals shall comply with the requirements of 4.3.3. **[A1]**

5.3 Independent auxiliaries exclusively for use with lighting equipment

5.3.1 General

Independent auxiliaries are electric or electronic devices designed to be applied external to a luminaire and to be used to control the current or voltage of a discharge or incandescent lamp. Examples are dimmers, transformers and convertors for lamps, ballasts for discharge lamps (including fluorescent lamps) and semi-luminaires for compact fluorescent lamps and for incandescent lamps.

NOTE 1 The requirements described in this subclause (5.3) are for the sole purpose of checking the electromagnetic emission characteristics of the auxiliary itself. Due to the variety of wiring circuits, it is impossible to describe requirements for the installation. In this respect, it is recommended that the manufacturer give guidelines for the proper use of the auxiliary.

NOTE 2 The requirements of this subclause (5.3) may be used for testing auxiliaries intended to be built into a luminaire. However, there is no obligation for such testing. Moreover, even when the auxiliary complies with the requirements of this subclause, the luminaire will always be tested.

5.3.2 Independent light regulating devices

5.3.2.1 Types of devices

There are two types of light regulating devices: those like dimmers which directly regulate the lamps, and those which have a remote control function to regulate the light output via a ballast or convertor.

5.3.2.2 Independent directly operating light regulating devices

Where such devices incorporate semiconductors, they shall comply with the terminal voltage limits given in tables 2a and 2b, otherwise no limits apply.

When several light regulating devices are contained in one product or enclosure, and when each individual device consists of an entirely self-contained regulating circuit (including all suppression components) and operates independently of the others (i.e. does not control, either by design or fortuitously, any load controlled by another individual regulator), then each device is tested separately.

5.3.2.3 Independent remote control devices

Where such devices generate a d.c. or low-frequency (<500 Hz) control signal, no limits apply. For radiofrequency or infrared operating devices, this standard does not apply. ^[A1] Other independent remote control devices shall comply with the requirements of 4.3.1 and 4.3.3. ^[A1]

5.3.3 Independent transformers and convertors for incandescent lamps

5.3.3.1 General

Transformers for incandescent lamps change only the voltage and do not convert the mains frequency, whereas convertors also convert the frequency. Both kinds of devices can incorporate means for regulating the light output of the lamps.

5.3.3.2 Independent transformers

For voltage transformers for incandescent lamps which do not regulate the voltage by means of active electronic components, the condition of 5.2.2 applies. Other independent transformers for incandescent lamps shall comply with the terminal voltage limits given in tables 2a and 2b.

5.3.3.3 Independent convertors

Independent electronic convertors for incandescent lamps shall either:

- a) comply with the terminal voltage limits given in tables 2a and 2b; or,
- b) where the convertor has a non-detachable load supply cable, or where the manufacturer gives strict installation instructions which define the position, type and maximum length of cable(s) to be connected to the lamp(s), then the convertor shall comply with the terminal voltage limits given in table 2a and with the radiated disturbance limits given in table 3, under these conditions.

5.3.4 Independent ballasts for fluorescent and other discharge lamps

5.3.4.1 Independent ballasts designed for a type of fluorescent lamp as mentioned in 5.2.3 and operated with starter shall comply with the minimum values of insertion loss given in table 1.

5.3.4.2 Other independent ballasts shall comply with the mains terminal voltage limits given in table 2a.

Where the ballast supplies the lamp with a current having a frequency in excess of 100 Hz, it shall comply with the radiated disturbance limits given in table 3.

^[A1] Where the light is regulated by an external device with separate control lines, the disturbance voltage at the control terminals shall comply with the requirements of 4.3.3. ^[A1]

5.3.5 Semi-luminaires

Semi-luminaires for compact fluorescent lamps and for incandescent lamps, sometimes called adaptors, are devices equipped, on the one side, with an Edison screw or bayonet cap to allow mounting in a standard incandescent lampholder and, on the other side, with a lampholder to allow the insertion of a replaceable light source.

Semi-luminaires shall comply with the terminal voltage limits given in table 2a.

Where the light source is operated at a frequency exceeding 100 Hz, the unit shall comply with the radiated disturbance limits given in table 3.

5.3.6 Independent starters and igniters

Independent starters and igniters for fluorescent and other discharge lamps are tested in a circuit as described in 8.9. They shall comply with the terminal voltage limits given in table 2a.