COMMISSION DIRECTIVE

of 7 June 1982

adapting to technical progress Council Directive 76/890/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference with regard to fluorescent lighting luminaires fitted with starters

(82/500/EEC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community,

Having regard to Council Directive 76/890/EEC of 4 November 1976 on the approximation of the laws of the Member States relating to the suppression of radio interference with regard to fluorescent lighting luminaires fitted with starters [1], and in particular Article 7 thereof,

Whereas, in view of experience gained and of the state of the art, it is now possible to match the requirements of the Annex to the abovementioned Directive more closely to actual test conditions;

Whereas the measures provided for in this Directive are in accordance with the opinion of the Committee on the Adaptation to Technical Progress of the Directives for the elimination of Technical Barriers to Trade in the Sector of Apparatus Producing Radio Interference,

HAS ADOPTED THIS DIRECTIVE:

Article 1

The Annex to Directive 76/890/EEC is replaced by the Annex to this Directive.

Article 2

The Member States shall by 1 December 1983 adopt and publish the provisions required to comply with this Directive and shall forthwith inform the Commission thereof.

They shall apply these provisions as from the same date as regards the freedom to market and use the equipment provided for in Article 4 of Directive 76/890/EEC, and as from 1 December 1984 as regards the ban on marketing referred to in Article 2 thereof.

Article 3

This Directive is addressed to the Member States.

Done at Brussels, 7 June 1982.

For the Commission

Karl-Heinz NARJES

Member of the Commission

(1) OJ No L 336, 4. 12. 1976, p. 22.

ANNEX

1. (1) SCOPE

These provisions relate to fluorescent lighting luminaires fitted with starters.

The provisions of Items 2.2 *et seq.* shall apply to luminaires for residential areas. Unsuppressed luminaires shall be subject only to the labelling requirements of Item 2.1.

2. GENERAL REQUIREMENTS

2.1. **Labelling of unsuppressed luminaires**

The words 'unsuppressed luminaire for use in non-residential areas' must be affixed to the luminaire. These words shall be used until the Committee on adaptation to technical progress has settled on an alternative.

Note:

The definition of non-residential areas is a matter for the competent national authority.

2.2. **Minimum values of insertion loss**

The minimum values of insertion loss shall be met by at least 80 % of series-produced luminaires with 80 % confidence.

Methods of application of the minimum values of insertion loss are shown in Item 7.

3. DEFINITIONS

For the purpose of this Annex, the definitions contained in IEC publication 50(902) — 1973 edition — International electrotechnical vocabulary (IEV), Chapter 902: Radio interference, apply.

4. LIMITS

4.1. **Insertion loss of switch-start fluorescent lamp luminaires**

For luminaires for tubular fluorescent lamps connected to electrical supplies feeding dwelling-houses in the voltage range 100 V/250 V between poles or to earth the minimum value of the insertion loss shall be 28 dB in the frequency range 150 to 160 kHz, 28 dB at 160 kHz decreasing linearly with the logarithm of the frequency to 20 dB at 1 400 kHz, and 20 dB in the frequency range 1 400 to 1 605 kHz.

The requirements do not apply to luminaires in which the lamps are powered at a frequency in excess of 100 Hz or to luminaires for which no method of measurement is defined in Item 5.

The limits apply throughout the frequency range and therefore the interference characteristics shall be assessed throughout.

(1) Point 1 of the Annex to Council Directive 76/890/EEC.

Note:

An initial survey or scanning of the complete range shall be made and the registered values shall be given at least at the following preferred frequencies and at all frequencies at which there is a minimum below the limits: 160, 240, 550, 1 000 and 1 400 kHz.

TABLE I

Frequency (kHz)	160	240	550	1 000	1 400
Minimum values of insertion loss (dB)	28	26	24	22	20

4.2. **Measurements of luminaires which cannot be measured with the methods defined in Item 5**

Luminaires which cannot be measured using the methods defined in Item 5 (for example, when it is impossible to replace the lamp by a dummy lamp, or when an electronic starter is incorporated) are subject to the requirements of Directive 76/889/EEC in the frequency band from 0·15 to 30 MHz.

5. METHODS OF MEASUREMENT OF THE INSERTION LOSS OF LUMINAIRES

5.1. **Circuits for the measurement of the insertion loss**

5.1.1. Luminaires used for linear lamps with a nominal diameter (1) of 25 or 38 mm.

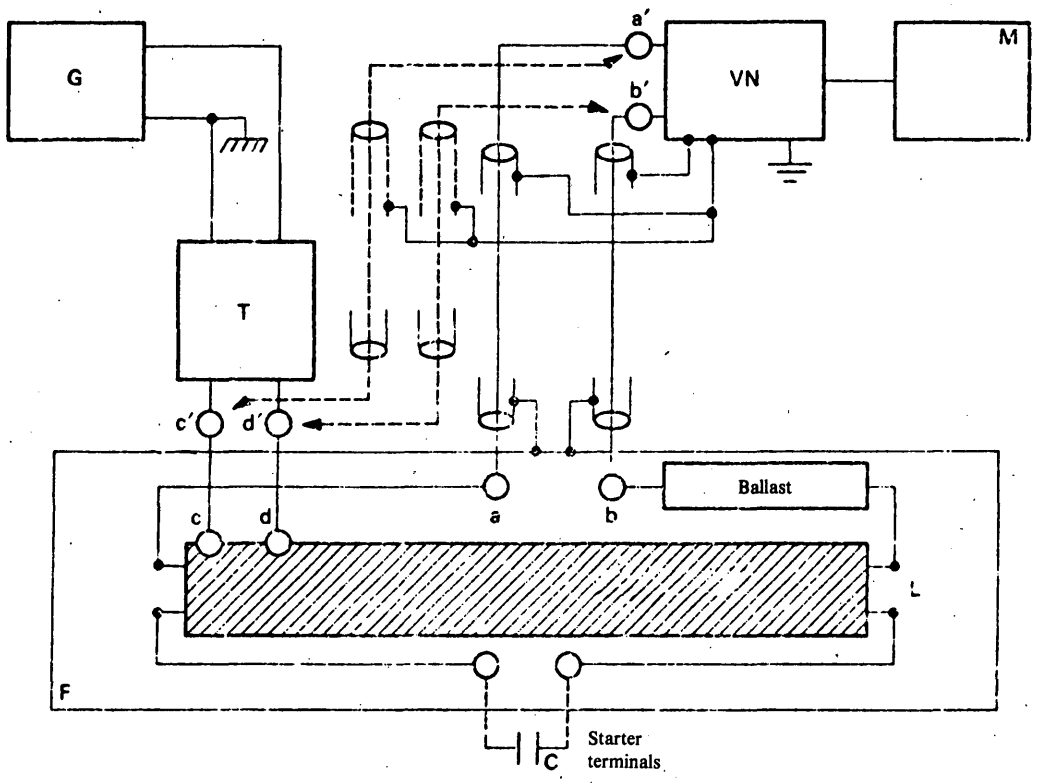
The insertion loss is measured in the circuit as shown in Figure 1 with dummy lamps as specified in Item 5.4 and Figure 4a.

In the case of lamps which have a nominal diameter of 25 mm, but which are interchangeable with lamps having a nominal diameter of 38 mm, the measurement of insertion loss shall be made with a dummy lamp with a nominal diameter of 38 mm, unless the manufacturer's instructions prescribe the exclusive use of a 25 mm diameter lamp.

For luminaires which can be operated only with lamps having a nominal diameter of 25 mm, insertion loss measurements are performed with a dummy lamp for the nominal diameter of 25 mm.

(1) According to the most recent version of IEC publication 81.

Figure 1



G	=	r.f. generator
T	=	unbalance/balance transformer (see Item 5.3)
VN	=	CISPR artificial mains V-network 150 Ω (in accordance with CISPR publication 16 — first edition, 1977)
M	=	measuring receiver (selective voltmeter)
L	=	dummy lamp (see Item 5.4)
F	=	luminaire
C	=	capacitor
a-b	=	mains terminals
a'-b'	=	input terminals of the V-network VN
c-d	=	terminals at dummy lamp L
c'-d'	=	output terminals of T
a-a' and b-b'	=	connections by coaxial cables (Z_o = 75 Ω) with the respective ends of the screens connected to the reference earth of VN and F
c-c' and d-d'	=	connections of the transformer to the dummy lamp made with unscreened leads not exceeding 10 cm in length

Note:

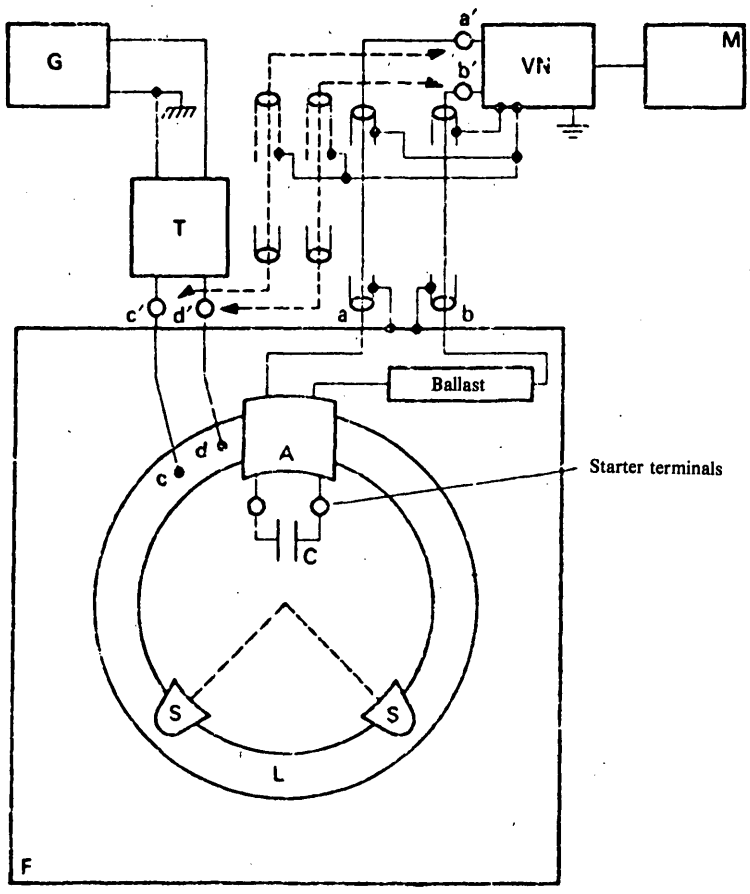
When measuring U-type fluorescent lamp luminaires the same circuit arrangement is to be used, but the linear dummy lamp shall be replaced by the U-type dummy lamp.

5.1.2. Luminaires used for circular lamps with a nominal diameter (1) of 28 or 32 mm.

The insertion loss is measured as shown in Figure 2.

(1) According to the most recent version of IEC publication 81.

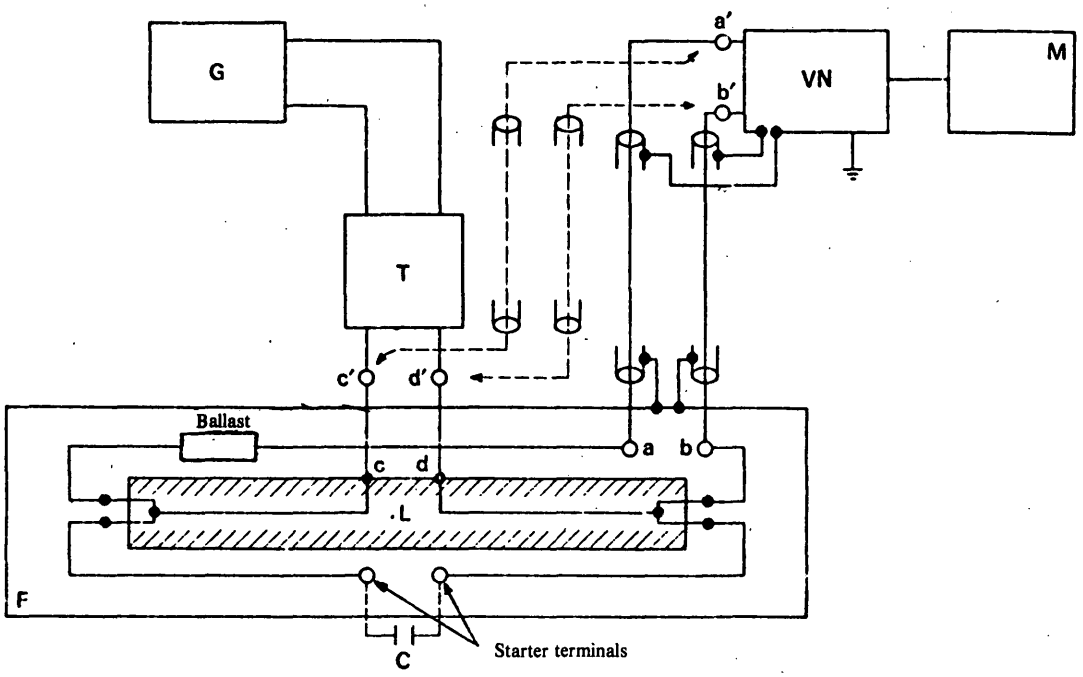
Figure 2



S	=	supports of insulating material
G	=	r.f. generator
T	=	unbalance/balance transformer (see Item 5.3)
VN	=	CISPR artificial mains V-network 150 Ω (in accordance with CISPR publication 16 — first edition, 1977)
M	=	measuring receiver (selective voltmeter)
L	=	dummy lamp (see Item 5.4)
F	=	luminaire
A	=	connector
C	=	capacitor
a-b	=	mains terminals
a'-b'	=	input terminals of the V-network VN
c-d	=	terminals at dummy lamp L
c'-d'	=	output terminals of T
a-a' and b-b'	=	connections by coaxial cables (Z_o = 75 Ω) with the respective ends of the screens connected to the reference earth of VN and F
c-c' and d-d'	=	connections of the transformer to the dummy lamp made with unscreened leads not exceeding 10 cm in length

5.1.3. Luminaires used for lamps other than those mentioned in Items 5.1.1 and 5.1.2. The insertion loss is measured as shown in Figure 2a.

Figure 2a



G	=	r.f. generator	
T	=	unbalance/balance transformer (see Item 5.3)	
VN	=	CISPR artificial mains V-network 150 Ω (in accordance with CISPR publication 16 — first edition, 1977)	
M	=	measuring receiver (selective voltmeter)	
L	=	tube of insulating material with internal connections as shown replacing the lamp	dummy lamp
F	=	luminaire	
C	=	capacitor	
a-b	=	mains terminals	
a'-b'	=	input terminals of the V-network VN	
c-d	=	terminals at centre of the dummy lamp L	
c'-d'	=	output terminals of T	
a-a' and b-b'	=	connections by coaxial cables (Z_o = 75 Ω) with the respective ends of the screens connected to the reference earth of VN and F	
c-c' and d-d'	=	connection of the transformer to the dummy lamp made with unscreened leads not exceeding 10 cm in length	

Note:

When measuring non-linear luminaires the same circuit arrangement is used, but the linear dummy lamp is to be replaced by a dummy lamp having the same dimensions as the original lamp.

5.1.4. For the methods given in Items 5.1.1, 5.1.2 and 5.1.3 the following conditions apply:

5.1.4.1. When the luminaire incorporates more than one lamp, each lamp is replaced in turn by the dummy lamp.

The insertion loss of multi-lamp luminaires in which the lamps are powered in parallel shall be measured for each lamp and the minimum value of insertion loss measured shall be used for comparison with the limit.

5.1.4.2. When measuring series-operated lamp luminaires, both lamps shall be replaced by dummy lamps. The input terminals of one dummy lamp shall be connected to the unbalance/balance transformer and the input terminal of the remaining dummy lamp shall be terminated with 150 Ω.

5.1.4.3. When starters having integral capacitors are used, as is usually the case, the starter is removed and replaced by a test capacitor of 5 000 pF ± 10 %.

However, in cases where the manufacturer fits a capacitor external to the starter and gives a warning against the use of an additional starter capacitor, the original capacitor is retained and no test capacitor is added.

Care shall be taken to ensure that the test capacitor maintains its characteristics over the whole frequency range covered by the measurement.

With the exception of this possible modification and the replacement of the lamps, the luminaire is measured as manufactured.

5.1.4.4. If the luminaire has a frame of insulating material, the back of the luminaire shall be placed on a metal sheet, to be connected to the reference earth of the artificial mains V-network VN.

5.2. **Measurement procedure**

5.2.1. The insertion loss is established by comparing the voltage U_1 of the measuring receiver, obtained by connecting the output terminals of the transformer to the terminals of the artificial mains network, with the voltage U_2 obtained when the transformer is connected to the artificial mains V-network through the luminaire to be measured.

5.2.2. The output voltage of the transformer is measured by means of the measuring receiver M. For this purpose, a direct connection is made between c′ and a′ and between d′ and b′ by coaxial cables (Z_o = 75 Ω) of 1 m length, the shield of which is connected to the reference earth of the V-network VN; the cables c-c′, d-d′, a-a′, b-b′ are removed.

5.2.3. The voltage U_1 (about 2 mV) measured between a′ or b′ and earth shall be independent of the two positions of the switch of VN.

5.2.4. The voltage U_2 measured with the luminaire connected may have different values and therefore may depend on the two positions of the switch of VN; the higher of them shall be retained as representative.

5.2.5. The insertion loss is given by:

$$20 \log_{10} \frac{U_1}{U_2} \text{ dB}$$

5.2.6. Where it is known that the insertion loss measured according to Figure 1, or for series-operated lamps according to Item 5.1.4.2, is a minimum for a given orientation of the dummy lamp(s), measurements may be made for this orientation only (e.g. for a luminaire with a single ballast and with the dummy lamp(s) inserted so that the relevant input terminal is directly connected to the neutral supply terminal of the luminaire). In cases where there is any doubt on this point, measurements shall be made for all possible orientations of the dummy lamp(s).

5.3. **Balance-unbalance transformer**

The balance-unbalance transformer, as depicted in the circuits of Figure 1, 2 and 2a, is used to obtain a symmetrical output voltage from the radio-frequency generator.

5.3.1. The essential requirements are:

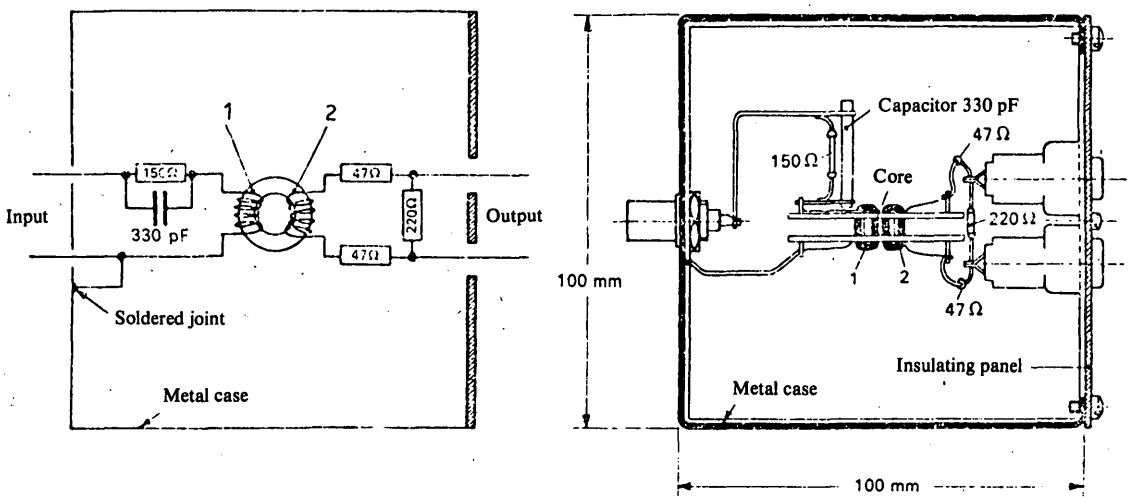
— the capacity between the secondary and the primary of the transformer must not be greater than 5 pF,

— the primary is connected to the metal box which encloses the device,

— the output impedance must be 150 + 4·5 Ω and substantially resistive in the frequency range 150 to 1 605 kHz.

Figure 3

Example of balance-unbalance transformer



1 = coil (20 turns)

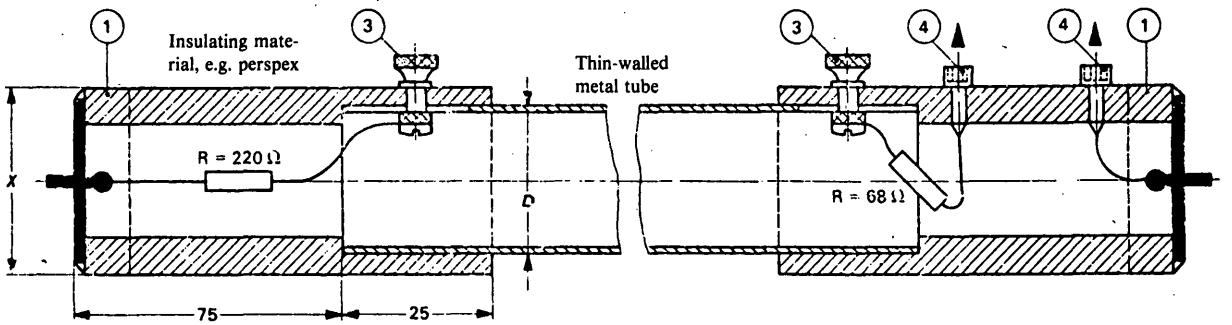
2 = coil (30 turns)

5.3.2. Connection of the transformer to the dummy lamp or the tube must be made with unscreened leads not exceeding 10 cm in length.

5.3.3. Figure 3 gives an example of a circuit and the construction of a suitable transformer (mechanical construction and electrical circuit).

Figure 4a

Configuration of linear and U-type dummy lamps

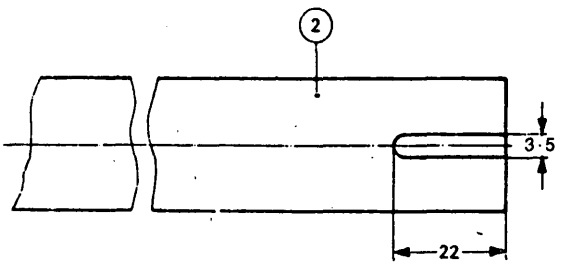


1 = Normal cap with interconnected pins

2 = Detail metal tube (suitably bent for U-type lamps)

3 = Screw with nut to connect metal tube electrically and mechanically with the dummy cap

4 = Sockets connected to unbalance-balance transformer

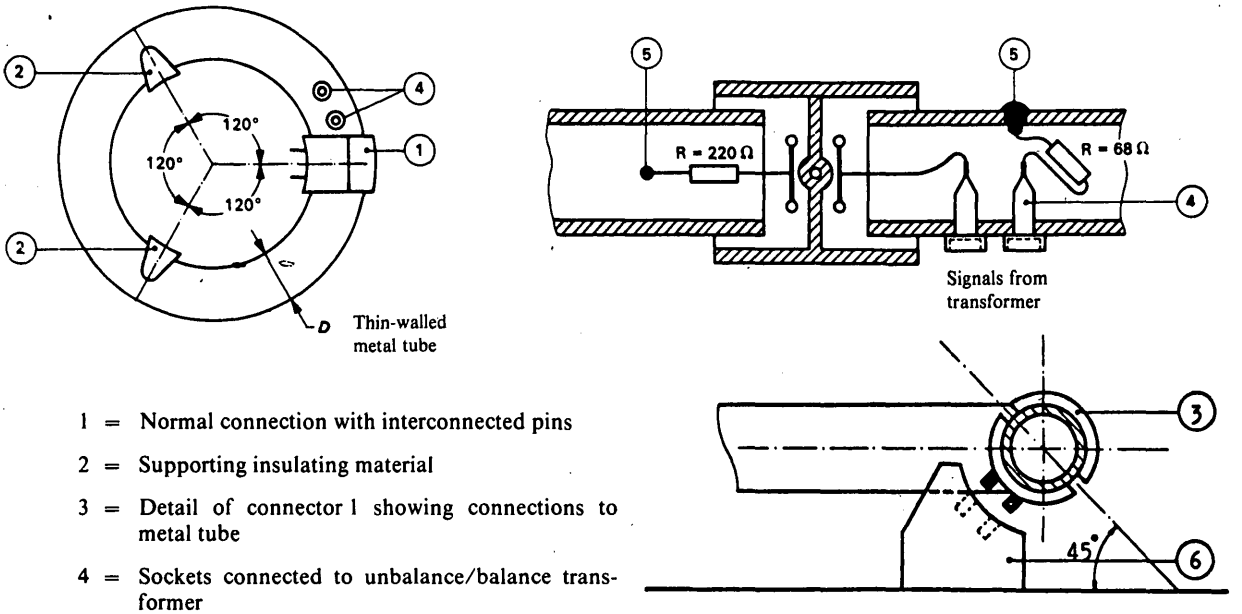


Nominal diameter of lamp	25	38
Diameter *D* of metal tube	20±0·5	28±0·5
Diameter *X* of normal cap	24	35

Note: All measurements in millimetres.

Figure 4b

Configuration of circular dummy lamps



1 = Normal connection with interconnected pins

2 = Supporting insulating material

3 = Detail of connector 1 showing connections to metal tube

4 = Sockets connected to unbalance/balance transformer

5 = Leads connected to metal tube

6 = Socket from luminaire

Nominal diameter of lamp (mm)	28	32
Diameter *D* of metal tube (mm)	20±0·5	25±0·5

5.4. **Dummy lamps**

The dummy lamps used in the circuits of Figures 1 and 2 simulate the r.f. properties of the lamp and are shown in Figures 4a and 4b.

When the dummy lamp is mounted in the luminaire it shall remain parallel to the metalwork of the luminaire. Any support necessary to achieve this must not appreciably alter the capacitance between the dummy lamp and luminaire.

Note:

Preliminary measurements can be performed using normal lamps provided with an external conductive coating. The length of the conductive coating equals the length measured cap-face to cap-face of the lamp minus 150 mm. This coating shall be symmetrically disposed.

(6.)

7. APPLICATION OF MINIMUM VALUES OF INSERTION LOSS IN TESTS FOR CONFORMITY OF LUMINAIRES IN SERIES PRODUCTION

7.1. Tests shall be made:

7.1.1. either on a sample of luminaires of the type, using the statistical method of evaluation set out in Item 7.3

7.1.2. or, for simplicity's sake, on one luminaire only.

7.2. Subsequent tests are necessary from time to time on luminaires taken at random from production, especially in the case indicated in Item 7.1.2. In the case of any dispute which could lead to a ban on sales, such a ban shall be considered only after tests have been carried out in accordance with Item 7.1.1.

7.3. Statistical assessment of compliance shall be made as follows:

This test shall be performed on a sample of not less than five, and not more than 12 items of the type, but if in exceptional circumstances five items are not available, then a sample of three or four shall be used. Compliance is achieved when the following relationship is met:

$$\bar{x} - k \cdot S_n \geqslant L$$

where:

$\bar{x}$ = the arithmetic mean value of the insertion losses of n items, in the sample,

S_n = the standard deviation of the sample, where:

$$S_n^2 = \frac{1}{n-1} \Sigma (x - \bar{x})^2$$

x = the insertion loss of an individual luminaire,

L = the minimum value of insertion loss,

k = the factor derived from tables of the non-central distribution which ensures with 80 % confidence that 80 % or more of the production exceeds the minimum value of insertion loss. Values of k as a function of n are given in Table 2 below.

TABLE 2

n	3	4	5	6	7	8	9	10	11	12
k	2·04	1·69	1·52	1·42	1·35	1·30	1·27	1·24	1·21	1·20

x, $\bar{x}$, S_n and L are expressed logarithmically; dB (rV) or dB (pW).

NOTE

This Annex is based on Publication 15 of the International Special Committee on Radio Interference (CISPR), first edition 1975, and Amendment No 1 (December 1978) of the International Electrotechnical Commission (CEI-IEC), 'Limits and methods of measurement of radio interference characteristics of fluorescent lamps and luminaires', as amended by Documents CISPR/F (SEC) Nos 50, 51 and CISPR/F (Germany) 6.

This Annex is also based on the harmonization document of the European Committee for Electrotechnical Standardization (Cenelec) HD 7 S2 (December 1979).