



Energy Efficiency Index for ballasts and light sources.

Background and basics.

The indoor lighting is a combination of external daylight and artificial lighting, which should be considered both in building design and in lighting design. Results of those will have in turn impact on mechanical design. The good energy efficiency comes from good understanding of user requirements and design applications. Proper surface colours and reflectance, light sources, luminaire and lighting controls are essential for user's satisfaction, well-being, productivity and energy efficiency.

EU-CE Marking of energy efficiency of light sources

The European Commission has introduced The Energy Labelling Directive, which is a legislative framework for requirements and performance levels for standard lighting bulbs. The directive requires that products be labelled to show their energy power consumption in such a manner that it is possible to compare the efficiency with that of other makes and models. Energy rating to classes A – G are used, where the class A represents the best practice in the market and class D the average energy use. CE-marking a product is not permitted unless it complies with the directives, which apply to it.

CELMA Energy Efficiency rating of ballasts for fluorescent lamps

The European Standard EN 50294 fixes the measuring methods for the total input power of the ballast –lamp system. Using this European Standard as a basis, CELMA (the European Federation of the National Association of the manufacturers of luminaires, control gear and lampholders) has fixed both energy classes and limit values for the ballast-lamp combination of the common fluorescent lamps. The CELMA “Energy Efficiency Index” system contains 7 classes: A1, A2, A3, B1, B2;C and D. The guideline is valid for mains-operated ballasts for fluorescent lamps. The EEI system comprises of the following lamp types:

Tubular fluorescent lamps T8

Compact fluorescent lamps TC-L, TC-D, TC-T and TC-DD

Requirements

Different maximum values of system power input including the light source and the ballast have been defined for common lamp types. As an example the seven EEI classes for a 36 W T8 (T26) fluorescent lamp are the following:

Class	Description	System power
D	magnetic ballasts with very high losses	> 45 W
C	magnetic ballasts with moderate losses	≤ 45 W
B2	magnetic ballasts with low losses	≤ 43 W
B1	magnetic ballasts with very low losses	≤ 41 W
A3	electronic ballasts	≤ 38 W
A2	electronic ballasts with reduced losses	≤ 36 W
A1	dimnable electronic ballasts	≤ 38 /19 W (at 100% -25%)

Phase out

According to European Directive 2000/55/EC the least energy efficient applications shall be gradually phased out from the market as follows:

Step 121.05.2002	class D	to be discontinued
Step 221.11.2005	class C	to be discontinued

After those dates only the classes A1 though B2 will be valid in of the voluntary CELMA EEI rating.

Customer choice

The wide range of high performance magnetic and electronic ballasts offered by leading European ballasts manufacturers enables immediate upgrading from conventional magnetic products to high performance versions, i.e. B2, B1, A3, and A2. In addition to these products the market also offers complete ranges of high performance controllable electronic ballasts, i.e. class A1, featuring additional advantages like lighting management systems.

The market also offers solely purchase-cost oriented electronic ballasts, which require a correct knowledge of the application i order to guarantee the performance expected by the end user.

Techniques

Light sources

There are choice of several types of light sources with different features for the different lighting applications. When selecting the bulb, attention should be put a.o. in light colour, colour reproduction, energy efficiency and service life. Also controllability and operating temperatures of the bulb are important.

Light output of light sources vary, among others, with type, size, voltage and operating hours. Light output (lumen/W) of some types and sizes are shown in table below. Lighting efficiency vary very much by the type and in some degree by the size. Some of the products have the CE energy rating markings to ease the selection.

Light source Type	Power input W	Lighting efficiency Lumen/W	Light flow Lumen
Incandescent bulb	25	6,5 – 8,8	162 – 220
	40	7,5 – 10,5	300 – 420
	60	9 – 11,6	540 – 695
	100	10 – 13,5	1000 – 1350
Fluorescent tube	15	46 – 66	700 – 1000
	18	52 – 75	940 – 1350
	36	58 – 93	2100 – 3350
	58	57 - 90	3350 - 5200
Compact fluorescent lamp	7	57	400
	11	54 – 81	590 – 890
	20	57 - 60	1140 – 1200
	36	80	2900
Cold cathode lamp*		40 - 85	
LED modules*		20 - 40	
Mercury vapour	50	40	2000
	125	53	6700
	250	59	14800
High pressure sodium	50	70	3500
	150	93	14000
	250	100	25000
Metal halide	35	94	3300
	70	82 – 94	5800 – 6600
	150	84 - 93	12700 - 14000

* Not EEI classified.