

Hong Kong Green Label Scheme

Product Environmental Criteria for

Electronic Ballasts (GL-007-009)



BACKGROUND

The Hong Kong Green Label Scheme (HKGLS) is an independent and voluntary scheme which aims to identify products that are, based on life cycle analysis consideration, more environmentally preferable than other similar products with the same function. The Scheme is organized by the Green Council (GC) with contributions from the HKGLS Advisory Committee and a number of supporting organizations.

The prime objectives of HKGLS are :

- For Consumers: assist in making purchases of products that are less harmful to the environment;
- For Industry: stimulate development and production of environmentally preferable alternatives.

This specification sets out the requirements that “Electronic Ballast for Fluorescent Lamps” products will be required to meet in order to be licensed to use the HKGLS label. The requirements include environmental criteria and product performance characteristics. The specification also defines the means to verify conformance with the requirements.

POTENTIAL ENVIRONMENTAL IMPACTS

Fluorescent lighting is the most common form of lighting in commercial buildings. Each fluorescent lamp⁽¹⁾ is operated by a ballast which provides the proper voltage to establish an arc between two electrodes. It also regulates the electric current flowing through the lamp, i.e. limiting the electrical current during normal lamp operation in order to stabilize the light output. There are two main categories of ballast: magnetic and electronic, the latter becoming more popular during the energy crisis of the 1980s and early 1990s.

Electronic ballast operates at a frequency above 20 kHz (kilo-Hertz) whereas magnetic ballasts operate at 50/60 Hz (the same frequency as AC mains). This high frequency operation of electronic ballast effectively improves the efficiency by about 10 % because of the increase in phosphor excitation. As a result, electricity consumption of the lamp/ballast systems and related environmental impact are reduced. With electricity savings on a wide scale, pollution is reduced.

With the increase in electronic component availability, their capabilities, and declining costs, electronic ballasts become more cost-effective than magnetic ballasts. Their use also entails lower maintenance costs, though the initial cost of electronic ballasts is higher.

LABEL OBJECTIVE

The aim of the environmental criteria developed for “Electronic Ballasts for Fluorescent Lamps” is to ensure the energy efficiency, energy saving, improved lighting performance and longevity feature of the product.

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PRODUCT DEFINITION

This criteria document⁽²⁾ concerns electronic ballasts for fluorescent lamps only.

Energy Efficiency Labelling Scheme (EELS) is a labelling scheme operated by the Electrical and Mechanical Services Department (EMSD) of the Hong Kong Special Administrative Region (HKSAR) with the aims to save energy by informing potential customers of the product's level of energy consumption and efficiency rating, so that buyers can take these factors into consideration when making their purchasing decision.

IEC means the International Electrotechnical Commission

ISO means the International Organization for Standardization

Luminous flux is the lumens generated by the specific linear fluorescent lighting system in question under stable operation at maximum power.

PRODUCT CRITERIA

The product environmental criteria for “Electronic Ballasts for Fluorescent Lamp” (GL-007-009) under the Hong Kong Green Label Scheme (HKGLS) are set out in the ensuing table.

Product Environmental Criteria	Verification Method(s)*
1. The minimum service life ⁽³⁾ shall be 50,000 lighting hours ⁽⁴⁾⁽⁵⁾ at the maximum permissible measuring-point temperature (tc) and under standard network conditions.	✓ Review of laboratory test report(s); AND ✓ Review of supporting information. The service life of the appliances at maximum permissible measuring-point temperature (tc) shall be indicated
2. The failure rate shall not exceed 2.5 % per 1000 lighting hours ⁽⁴⁾⁽⁶⁾ for the first 50,000 hours when tested.	✓ Review of laboratory test report(s); AND ✓ Review of supporting information.
3. The ballast must be designed for a lamp-operating frequency ⁽⁷⁾ of > 25 kHz ⁽⁴⁾⁽⁵⁾ .	✓ Review of laboratory test report(s); AND ✓ Review of supporting information.

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Product Environmental Criteria	Verification Method(s)*
4. The maximum power consumption of the system (electronic ballast plus fluorescent lamp) must not exceed the limits given in EELS for Electronic Ballast.	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s) (European Standard EN 50294); AND ✓ Review of supporting information.
5. It must be designed for a wide range of rated <i>mains voltage</i> ranging from 220 V - 10% to 240 V + 6% ^{(5)(8)(8a)(9)} . It shall function properly under over voltage and under voltage conditions ranging from 190 V to 280 V ⁽⁴⁾⁽⁵⁾ .	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s); AND ✓ Review of supporting information.
6. The system consisting of electronic ballast and lamp must have a ballast-lumen-factor ⁽¹⁰⁾ (BLF) of $1.00 \geq \text{BLF} \geq 0.95$ ⁽⁴⁾⁽⁵⁾ .	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s); AND ✓ Review of supporting information.
7. A constant luminous flux generated by the fluorescent lighting system must be guaranteed.	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s); AND ✓ Review of supporting information.
8. The electronic ballast must be easily dismountable into case, insulating foil, printed circuit board and electrolyte-containing components to allow material-specific recycling ⁽⁴⁾⁽⁵⁾ .	<ul style="list-style-type: none"> ✓ Inspection of product samples; AND ✓ Interview with relevant personnel.
9. Comply with the safety and performance requirements as refer to the EELS for Electronic Ballasts.	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s) (Safety – IEC 61347-2-3; Performance – IEC 60929:2003); AND ✓ Review of supporting information.
10. The ballast shall comply with the conditions as specified in IEC 61000-4 (electromagnetic compatibility)	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s) (IEC 61000-4-2 to IEC61000-4-6, IEC 61000-4-8 and IEC 61000-4-11); AND ✓ Review of supporting information.
11. Halogenated compounds (e.g. PVC) ⁽¹⁴⁾ , PBBs (polybrominated biphenyls), PBDEs	<ul style="list-style-type: none"> ✓ Inspection of product samples; AND ✓ Review of supporting information; AND

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Product Environmental Criteria	Verification Method(s)*
(polybromodiphenyl ethers), or short-chain chlorinated paraffins (C=10~13) whose chlorine concentration is 50% or more shall not be used as flame-retardants for plastic parts of the case weighing 25g or more.	✓ Interview with relevant personnel.
12. Plastic case parts shall be marked pursuant to ISO 11469 ⁽¹²⁾ . (<u>Optional</u>).	✓ Inspection of product samples; AND ✓ Interview with relevant personnel.
13. Packaging requirement	✓ Inspection of product samples; AND
<ul style="list-style-type: none"> • For bulk packaging and transportation shall fulfill the criteria for packaging materials (GL-Packaging). • For shock-absorbing packaging, polystyrene shall not be used. 	<ul style="list-style-type: none"> ✓ Review of supporting information; AND ✓ Interview with relevant personnel.

*Analytical testing should be accredited and performed by laboratories that meet the requirement laid out in the IEC/ISO 17025 or EN45001 standards or any equivalent systems e.g. HOKLAS, CNAS. Under special situation and with the approval from GC, test can be performed by in-house method by the accredited laboratory or manufacturer.

Notes

⁽¹⁾ Rather than using a standard filament, the operation of fluorescent lamps relies upon an electrical arc passing between two electrodes, one at either end of the lamp. This arc is conducted by a mixture of vaporized mercury and purified gases-mainly neon and krypton or argon, through a tube lined with phosphor. The resulting ultraviolet waves cause the phosphor to glow and emit fluorescent light.

⁽²⁾ References are drawn from the German Blue Angel Mark and the Thai standard. The Korean standard is only recently available in English.

⁽³⁾ A life of 50,000 hours is commonly claimed for ballasts. The key parameters that affect the operating or service life are operating temperature, failure rate.

⁽⁴⁾ Same as Blue Angel “Basic Criteria for the Award of the Environmental Label Electronic Ballasts for Fluorescent Lamps RAL-UZ 81”.

⁽⁵⁾ Same as Thailand Environment Institute’s “TGL-23 Electronic Ballasts”

⁽⁶⁾ Major electronic ballast suppliers indicate that the expected *failure rate* is 0.2 % per 1000 operating hours for the first 50,000 hours when tested under conditions that simulate an office environment.

Failure rate is dependent on operating temperature. As the relationship between temperature and component failure rate is exponential, relatively small changes in *case temperature* can have very significant effects on the service life. The case temperature is set such that the maximum operating temperature limit for the components is not exceeded.

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⁽⁷⁾ The operating frequency of electronic ballast is *above 20 kHz (kilo-Hertz)* whereas magnetic ballasts operate at 50/60 Hz (the same frequency as AC mains). This high frequency operation improves the efficiency by about 10 % because of the increase in phosphor excitation. It also enables the lamp to start easily. (However, since electronic ballasts operate at considerably higher frequencies than standard ballasts, they may create interference problems within communication systems).

⁽⁸⁾ The corresponding figures from the Blue Angel Mark standard is 220 V - 10% to 240 V + 6% as the voltage of typical low voltage mains in Germany is 230 V. The voltage for Thailand is the same as Hong Kong (220 V).

^(8a) The ballast industry rates ballast for +/- 10 % voltage variation for electronic ballast.

⁽⁹⁾ The Electrical and Mechanical Services Department (communication of 20 Aug 2003) confirmed that the low voltage electricity supply (50Hz alternating current) by utility companies in Hong Kong has to be 220V (+/- 6%) for a single phase supply.

⁽¹⁰⁾ BF (Ballast Factor) or BLF (Ballast Lumen Factor) means a ratio of the light output of the lamp when the ballast under test is operated at its rated voltage compared with the light output of the same lamp operated with the appropriate reference ballast supplied at its rated voltage and frequency.

^(11a) Korea Eco-Label EL202. Ballasts for Fluorescent Lamps [EL202-1999/2/2002-219]

⁽¹²⁾ ISO 11469:2000 Plastics – Generic identification and marking of plastics products: separable plastic parts (weighing 25g or more and with surface area 200mm² or more) are required to be visibly labelled to facilitate separation and collection in disposal.

⁽¹³⁾ "T12 tube" is the standard tube, the "T" standing for its tubular shape, the "12" standing for its diameter of 1-1/2" (measured in eighths of inches). T12 is in the process of being replaced by the "T8 tube"(1" dia.) which requires an electronic ballast as opposed to the magnetic ballast of the "T12 tube".

⁽¹⁴⁾ Exemption for electrical cables and electronic components.