GUIDANCE FOR MERCURY RELATED FLUORESCENT LAMP REGULATIONS

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GLOBAL LIGHTING ASSOCIATION

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Introduction

With global and regional regulations increasingly mandating the reduction, phase-out, or ban of mercury in fluorescent lighting products, aligning with these changes is critical for market participants and authorities. To address this need, the Global Lighting Association (GLA) has developed a comprehensive guidance document. This resource provides detailed information on fluorescent lamps for general and special purpose applications, along with references to international standards.

Designed to support compliance with mercury-related legislation, the document serves as a valuable tool for regulators, market authorities, and governments drafting similar policies. By clarifying distinctions between general lighting and special purpose applications, the GLA document encourages a harmonised approach to mercury regulations across regions. Additionally, it helps customs authorities and market actors navigate restrictions, ensuring essential-use lamps remain accessible. This initiative aims to streamline global compliance efforts, creating greater awareness and alignment in mercury reduction efforts within the lighting industry.

History of fluorescent lamps

Fluorescent discharge lamp technology employs mercury vapor in conjunction with an internal fluorescent material coating to convert electrical energy into a visible light spectrum. The lighting industry has significantly contributed to energy efficiency through the adoption of fluorescent technology, achieving a substantial reduction in energy consumption of over 80% compared to previous generation incandescent lamps. Over the course of their development, fluorescent lamps have undergone numerous innovative advancements in materials and manufacturing processes leading to substantial reduction in mercury content in lamps.

Halo phosphate (phosphor) fluorescent lamps

Halo-phosphate fluorescent lamps have been a staple in lighting since the mid-1920s, primarily due to their cost-effectiveness and ease of production. While they offer improved efficacy compared to incandescent lamps, they produce fewer lumens per watt than modern technologies such as triband fluorescent and LED lamps. Additionally, they have limited color rendering capabilities, which can result in colors appearing faded or distorted.

Despite these limitations, halo-phosphate lamps remain widely used for general lighting in homes, offices, industry, and public spaces due to their low cost. Hybrid phosphor lamps are also available, although they were not prevalent during the early adoption of halo-phosphate lamps.

Triband RGB (phosphor) fluorescent lamps

Triband RGB fluorescent lamps (sometimes called triphosphor) are a lighting advancement from the late 1970s that use three fluorescent materials to emit light in the primary color bands of red, green, and blue. They produce efficient emission in the RGB spectrum and medium-high-quality white light suitable for mainstream/most general lighting applications such as homes, shops and workplaces, etc. These lamps are highly efficient with luminous efficacy levels around 100 lumens per watt and improved colour rendering capabilities with an average colour rendering index (CRI) around 80. Triband lamps provided a significant upgrade from traditional halo-phosphate fluorescent lamps, which typically had lower CRI values and lower efficacies. Triband lamps dominated the general lighting market for three decades but began to be phased out for certain mainstream applications with the advancement of LED technology after 2010.

Special spectra lamps

Special spectra lamps feature advanced lighting technology that provides customised spectral outputs for specialised applications. They enhance effectiveness for industries like horticulture, photography, medical, and specific high colour rendering applications (e.g. museums, graphical industry and other high visibility tasks). While they may have lower white light efficacy than generic lamps, they offer tailored solutions for very specific spectral applications that dominated the general lighting market for three decades but began to be phased out for certain applications with the advancement of LED technology after 2010.

Terms and Definitions of fluorescent lamp types

1. Terms and definition of fluorescent lamp (FLs)[1] types: Fluorescent lamps are defined in IEC 60050-845-27-034. This is a discharge lamp of the low-pressure mercury type, in which most of the light is emitted by one or several layers of phosphors excited by the ultraviolet radiation from the discharge.[2]

The types of fluorescent lamps containing different standardised lamp bases are listed below:

[1] The terms CFLs, LFLs and NFLs refer to different types within the family of CFL-, LFL- and NFL-lamps and is also used as the plural form of CFL, LFL or NFL

[2] See https://www.electropedia.org/iev/iev.nsf/display?openform&ievref=845-27-034 for more information.

1.1 Compact Fluorescent Lamps (CFL)

- CFL is a term for a type of compact fluorescent lamp which includes both integrated CFL (CFL.i) and non-integrated (CFL.ni) lamps.
- CFLs are single capped fluorescent lamps specified as follows:
    - IEC60901 for CFL.ni lamps
    - IEC 60969 for CFL.i lamps

These lamps are of compact form with glass tubes of small diameters. Please note that CFLs exclude circular and square lamps, which are referred to as NFLs.

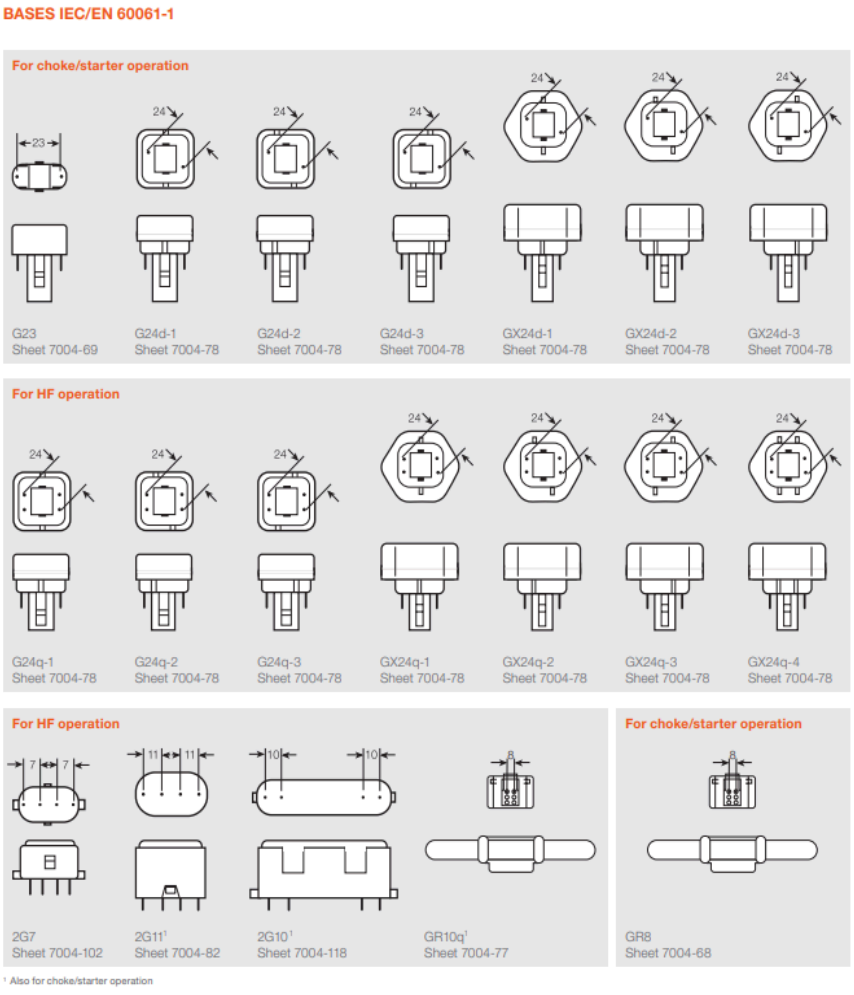
1.1.1 CFL.i lamp (integrated)

- Compact fluorescent lamps that are intended for general lighting services and are self-ballasted.
- Compact fluorescent lamps that are specified by IEC 60969. Self-ballasted lamps are defined in IEC 60969 as “an integrated lamp unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a light source and any additional elements necessary for starting and stable operation of the light source”.
- Performance requirements for CFL.i lamps are described in IEC 60969 and safety requirements are described in IEC 60968.

1.1.2 CFL.ni lamp (non-integrated)

Single-capped compact fluorescent lamp: a fluorescent lamp with a single cap, for operation on external circuits with either an internal or external means of starting (refer to CFL.ni definition according to IEC 60901 standard).

- Single-capped fluorescent lamps performance specifications are described in IEC 60901 and safety requirements are described in IEC 61199.
- Several different types of bases are used for CFL.ni lamps. (For example: G23, G24*, GX10*, GX23*, GX24*, GX32*, GY10*, 2G7*, 2G8*, 2G10*, 2G11*, GR*, etc.)



1.2 Linear Fluorescent Lamps (LFL)

Double-capped fluorescent lamps with a linear shape. A double-capped fluorescent lamp is defined in IEC 60081 as “a fluorescent lamp having two separate caps and mostly of tubular form and linear shape” Double-capped fluorescent lamp performance and safety specifications are described in IEC 60081.

LFL – double capped lamp

LFL – lamps (various diameters)

1.3 Non-linear Fluorescent Lamps (NFL)

Non-linear fluorescent lamps refer to a lamp family containing various shapes (e.g. circular, square, U-bend etc.) These lamps could also be double-capped according to IEC 60081 or single-capped according to IEC 61195.

NFLs are fluorescent lamps however they are different from LFL, CFL (CFL.i, CFL.ni), CCFL and EEFL due to their shape and diameter characteristics.

Below are some examples of typical NFLs.

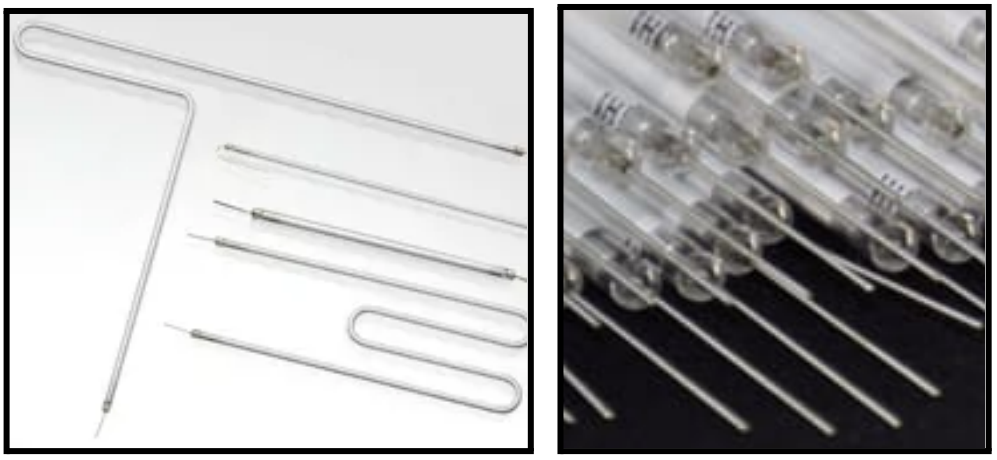
NFL – Circular lamps

NFL - Square shaped lamp

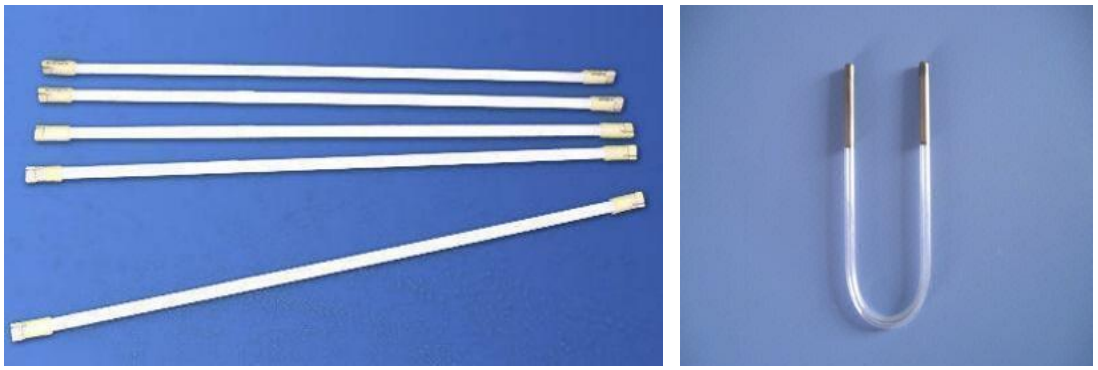
NFL - U bend lamp

1.4 Cold-cathode Fluorescent Lamps (CCFL) and External Electrode Fluorescent Lamps (EEFL) – lamps used for electronic displays

Cold-cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) are sub miniature lamps mainly used in backlighting applications, e.g. for LCD electronic display applications.



CCFL sub-miniature lamps



EEFL sub-miniature lamps

2. TERMS AND DEFINITIONS OF GENERAL LIGHTING AND SPECIAL PURPOSE APPLICATIONS

In the section that follows, the GLA has compiled a list of general and special purpose lighting applications to aid in the application and interpretation of mercury-related fluorescent lamp regulations.

This limited list may not encompass all varieties and specific niche applications, such as those developed by business-to-business companies used in various innovative existing and future applications. This list is intended for informational purposes and guidance and may be subject to change at any time without notice.

2.1 Terms and definitions of general lighting applications

The term 'general lighting' application is defined as the substantially uniform lighting of an area without provision for special local requirements. See definition in international standard IEC 60050(845, ed.2.0).

'General lighting' lighting application lamps are primarily marketed or commercialised for uniform light applications for visual orientation purposes. They have standardised shape, dimensions and cap.

General lighting applications are those which are not covered by the "special purposes" definition, where specific local requirements apply. General lighting is applied in the majority of lighting installations such as homes, apartments, offices, public buildings, retail, streets, highways, etc.

2.2 Definition of special purpose applications

The term 'special purpose' application is defined as a specific type of application that requires unique or specific requirements, unlike general lighting lamps that are designed for broader usage.

'Special purpose' applications lamps have documented and communicated application-specific benefits. These lamps feature either a specific design, light spectrum, functionality, specification or materials or are tested or approved for their

intended specific applications. In some mercury related legislation, specific special purpose lighting applications are considered to be out of scope. See section 3.

Examples of a non-exhaustive list of special purpose applications can be found below:

2.2.1 Applications requiring specialised spectral distribution such as:

- Medical, phototherapy, health effects, In-vitro diagnostics
- Sun tanning
- Black light (e.g., for diazo printing reprography, lithography, pest management, photochemical and curing processes)
- Black light blue (e.g., for entertainment, forensics, dermatology, banknote validation)
- Germicidal disinfection
- Pet or animal care (e.g., aquaria, terrarium, reptiles)
- Industrial, chemical and biological processes, diagnostics and monitoring e.g., food, medicines, vaccines and biotech processes or monitoring equipment.
- Technical lighting requiring specific colour spectrum e.g., adapted to the response of film material, graphic industry, colour comparison
- Applications requiring an average color rendering index CRI/Ra of 87 or higher as specified in the "Colour Rendering Index Evaluation Method for Light Sources" for example high colour rendering index applications like food lighting, bakeries, museums, etc.
- Coloured lighting applications (incl. saturated colours). The chromaticity range of coloured light is when the chromaticity coordinates of a lamp is within the following range: (Ref. (EU)2015/1428)

$$x < 0{,}270 \text{ or } x > 0{,}530$$

$$y < -2{,}3172\,x^2 + 2{,}3653\,x - 0{,}2199 \text{ or } y > -2{,}3172\,x^2 + 2{,}3653\,x - 0{,}1595$$

- Horticultural lighting
- Lighting for birds or other animals with an eye-sensitivity-adapted spectrum

2.2.2 Applications requiring specialised light distribution & signaling such as:

- Projection, automotive headlights, sports arena lighting, studio lighting, show effect lighting, theater lighting (e.g., entertainment)
- Traffic signals and signage
- Signaling applications (e.g., road, railway, marine, traffic)
- Reprography (e.g., Image capture and image projection

2.2.3 Applications requiring specialised operating conditions (chemical or physical) such as:

- Potentially explosive atmospheres requiring specified lamps (e.g. with special lamp base and/or ignition features
- extreme physical conditions (such as vibrations or temperatures below – 20 °C or above 50 °C) requiring specified lamps (e.g. with special ignition features)
- Radiological and nuclear medicine installations
- Impact-resistant lamps
- Waterproof lamps

2.2.4 Applications requiring the use of specialised luminaires, such as:

- Emergency lighting luminaires using specified emergency lamps
- Products incorporating lighting products, where the primary purpose is not lighting and the product fulfills its primary purpose during use (such as refrigerators, ovens, sewing machines, endoscopes, blood analysers, kitchen hoods, etc.);
- Lighting or scientific instruments and/or the calibration of instruments
- Large scale fixed installations
- Large scale stationary industrial tools
- Transportation (railway, buses, trucks, marine, aircraft, subway etc.)
- Military and Space equipment
- Motor vehicles, their trailers and systems,
- Civil aviation aircraft
- Railway vehicle lighting
- Marine equipment
- Luminaires designed to be incorporated into machinery, furniture, etc.

3. EXEMPTIONS AND OUT OF SCOPE APPLICATIONS IN MERCURY RELATED FLUORESCENT LAMP LEGISLATION

Due to their essential nature, specific, small scale special purpose applications have been determined to be out of scope or exempted from various mercury related fluorescent lamp legislation. Examples are listed below.

3.1 EU RoHS directive – (EU) 2024/232 out of scope

The EU RoHS Directive restricts hazardous substances like lead, mercury, and cadmium in electrical and electronic equipment (EEE), to reduce environmental impact and health risks. It mandates compliance and documentation whilst allowing various exemptions for the use of regulated substances in products or materials.

Out of scope:

(a) equipment which is necessary for the protection of the essential interests of the security of Member States, including arms, munitions and war material intended for specifically military purposes

(b) equipment designed to be sent into space

(c) equipment, which is specifically designed, and is to be installed, as part of another type of equipment that is excluded or does not fall within the scope of this Directive, which can fulfill its function only if it is part of that equipment, and which can be replaced only by the same specifically designed equipment

(d) large-scale stationary industrial tools

(e) large-scale fixed installations

(f) means of transport for persons or goods, excluding electric two-wheel vehicles which are not type-approved

(g) non-road mobile machinery made available exclusively for professional use

(h) active implantable medical devices

(i) photovoltaic panels intended to be used in a system that is designed, assembled and installed by professionals for permanent use at a defined location to produce energy from solar light for public, commercial, industrial and residential applications

(j) equipment specifically designed solely for the purposes of research and development only made available on a business-to-business basis

Besides out of scope applications, the EU RoHS directive also allows several exemptions for essential use applications which can be applied for a prolongation for renewal every 5 years.

3.2 UN Minamata Convention - Annex A mercury-added products (MAP)

The UN Minamata Convention's Annex A on mercury-added products identifies items containing intentionally added mercury and mandates their phased elimination. This includes batteries, switches, relays, fluorescent lamps, cosmetics, and certain medical devices. The goal is to minimise the health and environmental impacts, with timelines for phasing out, based on available alternatives

The following products are excluded from this annex:

(a) Products essential for civil protection and military uses

(b) Products for research, calibration of instrumentation, for use as reference standards

(c) Where no feasible mercury-free alternative for replacement is available, cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays, and measuring devices

(d) Products used in traditional or religious practices

(e) Vaccines containing thiomersal as preservatives

3.3 Mercury added products in second-hand equipment.

If mercury added products (MAPs) are included in second-hand equipment for import and export, they are considered essential replacement parts and considered to be exempted according to interpretation of the UN secretariat and several countries attending UN MINAMATA COP meetings. Examples include medical equipment, trucks, buses, airplanes, cruise ships, etc.

ABOUT THE GLA

The Global Lighting Association (GLA) is the leading voice for the lighting industry worldwide, representing over 5,000 lighting manufacturers and generating $75 billion in annual sales. Through its network of 27 national and regional lighting associations, the GLA advocates for policies and practices that promote sustainable lighting solutions, energy efficiency, and human well-being. The GLA is committed to fostering a collaborative environment that supports innovation, fair competition, and the growth of the lighting industry on a global scale.

This document is designed to provide advice and guidance for relevant stakeholders. It is subject to change or update without prior notice. The content is compiled based on the best available knowledge of participating GLA members, who cannot be held liable for any inaccuracies, omissions, or misinterpretations.

To learn more, visit our website at globallightingassociation.org.