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Lighting systems - Electro-mechanical interfaces - Part 1: Safety

Systèmes d'éclairage - Interfaces électromécaniques - Partie 1: Sécurité

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TITLE:

Lighting systems - Electro-mechanical interfaces - Part 1: Safety

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

To support interchangeability safety, TC 34 established the IEC 63494-1 project to prepare a general safety standard covering Electro-Mechanical Interfaces in Lighting Systems. The following manuscript for this proposed standard has been prepared by TC 34/WG 14 experts.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Lighting systems – Electro-mechanical interfaces – Part 1: Safety

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International Standard IEC 63494-1 has been prepared by IEC technical committee 34: Lighting.

The text of this standard is based on the following documents:

FDIS	Report on voting
XX/XXX/FDIS	XX/XXX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The National Committees are requested to note that for this publication the stability data is 20XX.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

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Lighting systems – Electro-mechanical interfaces – Part 1: Safety

1 Scope

This document specifies the safety requirements for electro-mechanical interfaces connecting lighting system devices to luminaires. These interfaces are used to mechanically connect, electrically power, and enable communication of lighting system devices on luminaires. Electro-mechanical interfaces up to and including 1 000 V AC or 1 500 V DC are included. The document specifies safety related mechanical, electrical, ambient conditions, and construction requirements for the interface components including protective covers. Specific requirements for the devices that can utilize the interface such as sensors, communication modules, cameras, etc. are out of scope for this document.

The document does not specify the following aspects:

- The lighting technology
- The illumination performance
- Data communication
- Functional safety
- The performance and interchangeability of devices on the interface
- Electromagnetic compatibility (EMC)

The document does not specify safety for the following:

- Product safety covered in existing standards (e.g. control gear, light sources, luminaires, electrical connectors, PoE, USB)
- Device safety aspects for devices using the electro-mechanical interface
- Couplers for mains input power to the luminaire

The purpose of IEC 63494-1 is to provide a set of requirements and tests which are considered generally applicable to electro-mechanical interfaces. Detailed requirements for particular electro-mechanical interfaces are specified in the IEC 63494-2 series.

NOTE: If the electro-mechanical interface is not standardized in the IEC 63494-2 series then interchangeability aspects are not covered.

NOTE: Although manual operation is anticipated at this time, future use of insertion and removal tools can be utilized and covered by this safety standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 series, *International Electrical Vocabulary*

IEC 63105 *Lighting systems and related equipment – Vocabulary*

IEC 60598-1:202X Ed 10.0 *Luminaires – Part 1: General requirements and tests (in maintenance cycle, see 34D/1690/CDV)*

IEC 62504 *General lighting – Light emitting diode (LED) products and related equipment – Terms and definitions*

IEC 60320-3 *Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges*

IEC 61984:2008 *Connectors - Safety requirements and tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions in IEC 60050 (IEV), IEC 63105 and IEC 62504 apply.

ISO and IEC maintain terminological databases for use in standardization at the following address:

150 • ISO Online browsing platform: available at <http://www.iso.org.obp>

151 • IEC Electropedia: available at <http://www.electropedia.org/>

152 **3.1 device-side interface**

153 part of the device for use with a luminaire-side interface, comprising one or more electrical contacts
154 embedded in insulating material

155 **3.2 luminaire-side interface**

156 connector intended for use in a luminaire or similar apparatus, comprising one or more electrical
157 contacts mounted in a holder made of insulating material

158 **3.3 base plate**

159 device-side interface for use with a mating receptacle

160 NOTE TO ENTRY: The base plate may be an integral or separable part of the device.

161 **3.4 receptacle**

162 luminaire-side interface mounted on an exterior or interior surface of the luminaire


163 **4 General**

164 The requirements of clauses 5, 6, 7, 8 and 9 are applicable to electro-mechanical interfaces not covered
165 in an IEC 63494-2 series standard. Specific requirements for particular electro-mechanical interfaces
166 can be found in the relevant IEC 63494-2 standard. A recommended grouping of tests, sequential
167 ordering and potential gauges is found in Annex A.

168 **5 Marking**

169 **5.1 Product identification**

170 The following shall be marked on the electro-mechanical interface product or on the smallest unit
171 package if space is limited on the product.

- 172 • Mark of origin (this may take the form of a trade mark, the manufacturer's identification mark or
173 the name of the responsible vendor)
- 174 • Maker's model number or type reference
- 175 • Positions for the contacts and protective earthing contacts, if applicable
- 176 • Marking of protective earthing contacts shall apply the symbol  or PE

177 Note: The protective earthing symbol is from IEC 60417-5019:2006-08.

178 **5.2 Product characteristics**

179 The following information shall be given either on the electro-mechanical interface or be made
180 available in the datasheet or website of the manufacturer or responsible vendor:

- 181 • Maximum temperature, T_{max} , and, if declared, the heat resistance of specific components
182 deviating from this T_{max} temperature
- 183 • Maximum current rating
- 184 • Rated voltage and current for each contact
- 185 • IP rating of the electro-mechanical interface
- 186 • Circuit type supported by the interface (e.g. SELV, PELV, FELV, LV, etc.)
- 187 • Type of insulation between different electrical circuits and accessible conductive parts
- 188 • Receptacle to luminaire mounting dimensions and characteristics
- 189 • Device to base plate mounting dimensions and characteristics

190 **5.3 Durability and legibility**

191 Marking shall be durable and legible.

Compliance is checked by inspection and by trying to remove the marking by rubbing lightly for 15 s each time, with two pieces of cloth, one soaked with water and the other with aliphatic solvent hexane. As an alternative, a reagent grade hexane with a minimum of 85 % as n-hexane may be used.

NOTE 2 n-hexane according to ACS (American Chemical Society) is identified as CAS# 110-54-3.

The marking shall be legible after the test. If the marking is on a separable label, the label shall remain fixed to the product.

6 Mechanical Safety

6.1 Physical protection during insertion and removal

The electro-mechanical interface shall be designed and constructed to provide ease-of-insertion and removal of the device-side interface into and from the luminaire-side interface without undue force or torque by hand without the use of tools.

The following test shall be applied on a receptacle plus device or cap, if applicable: Prepare the sample by completing 5 mating cycles of the device-side interface and luminaire-side interface, then measure the insertion and removal force or torque, as applicable.

Compliance: For plug-in interfaces, the insertion and removal force shall not exceed 50 N.

Compliance: For twist-lock interfaces, the insertion and removal torque shall not exceed 5 Nm.

Compliance: For interfaces with both a plug-in and twist-lock features, both of the above requirements shall be met.

The installer shall be protected against pinching or sharp edges without needing the use of personal protective equipment during insertion or removal of the device.

Compliance shall be checked by inspection.

6.2 Physical safety in latching release mechanisms

If the device electro-mechanical interface is designed with a release mechanism for safe removal from the luminaire-side interface, the mechanism shall operate by hand without undue force and fully release the device.

The maximum force for hand operation shall be 50 N.

The maximum torque for hand operation shall be 5 Nm.

Compliance shall be checked by inspection.

6.3 Protection against damaging pins during insertion

The electro-mechanical interface shall be designed and constructed to protect all electrical pins from damage during insertion of the device-side interface into the luminaire-side interface. The pins shall not be broken, bent or otherwise damaged after 5 mating cycles in normal use conditions.

Compliance shall be checked by inspection.

6.4 Mechanical strength

6.4.1 General

Receptacles and base plates shall withstand impacts from foreign objects. The impact test setup and procedure shall be as specified in IEC 60598-1:202X, clause 7.13 (see edition 10.0 34D/1690/CDV).

Compliance is checked by the test in 6.4.2 or 6.4.3: After each test, the sample shall show no damage, in particular:

- a) live parts shall not have become accessible;
- b) the effectiveness of insulating linings and barriers shall not have been impaired;