UNECE approach for LED replacement light sources for filament light sources in R37*

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*instead of LED retrofits in R128
The approach (legal and technical equivalence)

• The approach is based on
  • the previous discussions on technology neutral
  • performance based requirements and guidance given in the TFSR and at GRE

• No further work on LED “retrofits” into R128

• Open R37 to allow replacement light sources in LED technology
  • Use the photometric equivalence criteria from LED substitute light sources
  • Resolve open issues not fully addressed by LED substitute light sources

• Objective
  • a light source in incandescent technology and a light source in LED technology
    with the same category designation
    • can be both approved according to R37 and will have the same “legal status”
The **new document scope**

<table>
<thead>
<tr>
<th>R37</th>
<th>R99</th>
<th>R128</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Light Sources</td>
<td>HID light sources</td>
<td>LED light sources</td>
</tr>
<tr>
<td>LED replacement light sources</td>
<td></td>
<td>LED substitute light sources</td>
</tr>
</tbody>
</table>

**R.E.5 Category sheets**

- Filament light sources
- HID light sources
- LED light sources, including:
  - LED substitute light sources
  - LED replacement light sources
The new document scope

R37
Filament Light Sources
- Thermal
- LED

R99
HID light sources

R128
LED light sources
LED substitute light sources

R.E.5 Category sheets
Filament light sources
- Thermal
- LED

HID light sources

LED light sources, including:
- LED substitute light sources
LED Replacement light sources in R37

• Photometric equivalent to the incandescent filament counterpart
  • Using equivalence criteria from LED substitutes, incl. 3000K limit for white signaling light sources

• Addressing electrical interface for failure detection
  • Majority of functions / cars on the road have no failure detection (DI excluded)
  • Optional „external electronics“ to support correct failure detection

• Addressing PWM operation / dimming

• Addressing thermal mission profiles

• Additional user information and marking
Additional slides provided by the IEC expert as a „first study“
References or duplication

R37
Filament Light Sources
LED replacement light sources
Refer to the relevant technical requirements to LED light sources in R128

R99
HID light sources

R128
LED light sources
LED substitute light sources

Additional technical requirements and requirements to packaging are derived from R128 Substitute requirements

R.E.5 Category sheets
Filament light sources
HID light sources
LED light sources, including:
• LED substitute light sources
• LED replacement light sources

Refer to the relevant technical requirements to LED light sources in R128

Additional technical requirements and requirements to packaging are derived from R128 Substitute requirements
Replacement light sources

- Original technology
  - Original light source category
  - Substitute light source category

- Alternative technology
  - Comparable light source category as alternative to the original light source category

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Alternative</td>
<td>One of two or more available possibilities</td>
</tr>
<tr>
<td>Comparable</td>
<td>Of equivalent quality; worthy of comparison</td>
</tr>
<tr>
<td>Corresponding</td>
<td>Analogous or equivalent in character, form, or function; comparable</td>
</tr>
<tr>
<td>Counterpart</td>
<td>A person or thing that corresponds to or has the same function as another person or thing in a different place or situation.</td>
</tr>
<tr>
<td>Equivalent</td>
<td>A person or thing that is equal to or corresponds with another in value, amount, function, meaning, etc.</td>
</tr>
<tr>
<td>Interchangeable</td>
<td>Put each of (two things) in the other's place; (of a thing) be able to be exchanged with another</td>
</tr>
<tr>
<td>Original</td>
<td>Present or existing from the beginning; first or earliest</td>
</tr>
<tr>
<td>Replacement</td>
<td>Replace: Take the place of.; Provide a substitute for (something that is broken, old, or inoperative); Fill the role of (someone or something) with a substitute.; Put (something) back in a previous place or position</td>
</tr>
<tr>
<td>Retrofit</td>
<td>Add (a component or accessory) to something that did not have it when manufactured.</td>
</tr>
<tr>
<td>Substitute</td>
<td>A person or thing acting or serving in place of another.</td>
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</tbody>
</table>
### 3.3. LED light sources

*Not for use in conformity of production control of lamps.*

<table>
<thead>
<tr>
<th>Category</th>
<th>Sheet number(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY21W</td>
<td>PY21W/LED/1 to 4</td>
</tr>
</tbody>
</table>
R.E.5

Annex 3, Sheets for LED light sources

• Cap
  • The LED replacement light source category
    • the same cap as its counterpart filament light source category

• Electrical current
  • Specify compatibility with the counterpart filament light source for failure detection, if present
  • Specify values in two PWM voltage ranges if the counterpart filament light source category might be used for dual level operation (e.g. P21W for stop/tail)
R128

1. Scope
This Regulation applies to LED light sources shown in Annex 1 and intended for use in approved lamps of power-driven vehicles and of their trailers.

Annex 1
Sheets¹ for LED light sources
The sheets of the relevant LED light source category and the group in which this category is listed with restrictions on the use of this category shall apply as incorporated in Resolution R.E.5 or its subsequent revisions, applicable at the time of application for type approval of the LED light source; however, the sheets of LED replacement light sources in the LED light source categories’ group 5 of R.E.5 are excluded from this annex.
Title of the Regulation

Uniform provisions concerning the approval of filament lamps* light sources and their LED replacement light sources for use in approved lamps of power-driven vehicles and of their trailers

* This should be corrected only at the front page
1. **Scope**

1.1. This Regulation applies to filament light sources shown in Annex 1 and intended for use in approved lamps of power-driven vehicles and of their trailers.

1.2. This Regulation applies to LED replacement light sources shown in Annex 1,

   (a) having a counterpart filament light source with the same category designation shown in Annex 1,

   (b) intended for use in lamps of power-driven vehicles and of their trailers approved for this counterpart filament light source, and

   (c) keeping the characteristics of these lamps when used in these lamps.*

* See R115, LPG systems
Annex 1

Sheets* for filament light sources and their LED replacement light sources

The sheets of the relevant filament-light source category and the group in which this category is listed with restrictions on the use of this category shall apply as incorporated in Resolution [R.E.4] R.E.5 or its subsequent revisions, applicable at the time of application for type approval of the filament-light source.
R37

2. Administrative provisions

2.1. Definitions

2.1.1. Definition of "category"

The term "category" is used in this Regulation to describe different basic design of standardised filament light sources and to describe different basic design of their counterpart LED replacement light sources, if any. Each category has a specific designation, as for example: "H4", "P21W", "T4W", "PY21W" or "RR10W". The designation of a LED replacement light source category is the same as of its counterpart filament light source category, as for example “PY21W”.
2.3.1.5. In the case of LED replacement light sources, the following symbol:

... 

2.3.4. LED replacement light sources shall be marked “(LED)”. This mark shall be placed after the designation of the relevant LED replacement light source category separated by a single space, e.g. “P21W (LED)”.
3. Technical requirements

3.1. Filament light sources

3. 1.1. Definitions

3.2. LED replacement light sources

3.2.1. The LED replacement light source shall, in addition to the technical requirements of this Regulation, also conform to the relevant* technical requirements for LED light sources of the latest version of Regulation No. 128;

3.2.2. The LED replacement light source shall be equipped with a cap of the same cap designation as its counterpart filament light source as defined in the relevant data sheet of Annex 1;

3.2.3. The electrical current of the LED replacement light source shall be measured at ambient temperature of (23 ± 2) °C in still air after 1 minute and after 30 minutes of operation at test voltage.

Measured values of the electrical current shall be within the limits as specified in the relevant data sheet of Annex 1.

To consider additional test points for
• PWM operation e.g. for dual level operation
• Higher ambient temperature values

* list numbers of relevant paragraphs
3.2.4. The LED replacement light source shall comply with the technical requirements to an electrical/electronic sub-assembly (ESA) as specified by Regulation No. 10 and its series of amendments in force at the time of application for type approval.

3.2.5. The LED replacement light source shall not emit light when activated for 2 milliseconds or shorter.

3.2.6. The LED replacement light source including its electrical or electronic controls not integrated with the LED replacement light source, if any, shall allow the proper functioning of monitoring and failure detection systems used as for their counterpart filament light sources.

3.2.7. The correlated colour temperature of LED replacement light sources emitting white light shall be no more than 3000 K, unless otherwise defined in the relevant data sheet in Annex 1.