GTB Working Group
Light Sources
Status October 2013
1. Road map
   Update of presentation to GRE #65, March 2011

2. Light source work items in the pipeline

3. GTB WG LS “Feasibility of LED retrofit” study
   Legal framework draft:
   “How to implement in the UN Regulations”
1. Road map
Outlook - theoretical

- Research
- Learning
- Maturity
- Consolidation
- Phasing out

Not on scale
Technology curves - theoretical

Filament  Halogen  HID  LED  OLED  ???

Not on scale
Technology curves?

- Halogen (HL)
- Filament (SL)
- Type “A”
- Type “B”
- LED (SL)
- LED (HL)
- HID (HL)
- OLED?

Not on scale
Automotive Tree of Light

Tree adapted from http://www.dragonartz.net/
2. Light source work items the pipeline
Light source work items the pipeline

- Development of criteria for LED categories for head lighting, e.g.: thermal grade, contrast requirements, electrical interface
- Feasibility of LED retrofit, technical aspects and equivalence criteria
  - New Approach and Harmonisation
  - Editorial R37: colour coating shall cover the entire bulb
  - Development of category LR3, a cost effective, red LED light source
  - Inserting LED performance requirements in IEC60809 as in R128
  - Consideration of IEC items

- Editorial R37: determination of filament length
  - Feasibility of LED retrofit, legal and administrative aspects

- Non-replaceable filament lamps requirements
- WT(Y)21W, WT(Y)21/7W (plastic wedge base)
- Road replacement of light sources requirements
- Update of references to IEC and CIE publications
- Extending approval numbering combinations

IEC 60061: Caps and holders for new categories
  - Colour endurance test for dual filament light sources
  - Non-replaceable filament lamps requirements
  - Colour measurement of halogen signal light sources
  - Insertion of LED light source performance requirements

Update references to light source sheets R37, R99, R128

  - Test requirements for LED components
  - Update test requirements of HID light sources

IEC SC 34B (Caps, holders and gauges)
IEC SC 34A (Light sources)

Gre

WP.29

Enforcement

IEC SC 34B (Caps, holders and gauges)
IEC SC 34A (Light sources)

GTB

GTB WG LS TF LED

GTB WG LS

GTB

GRE

Awaiting enforcement
R37
- PY21/5W (dual amber filament)
- colour measurement of hal. sign. l.s. R128
- LW2
- Editorial updates

Enforced:
- R37 phasing out categories set 3:
  H12, H13A, HIR1, HB3A, HB4A, HS6, PR21/4W, PR27/7W, T1.4W, WY2.3W
- R99: update ref to IEC

Editorial updates

GTB Document CE-4930 rev.1
3. GTB WG LS “Feasibility of LED retrofit” study
“Feasibility of LED retrofit”

WGLS work item

To investigate feasibility of new LED categories according to R128, as replacement parts for filament light source categories according to R37.

Study should include:

• Development of equivalence criteria
• Investigation on how to implement retrofit provisions in the relevant UN regulations*

*CE-4871
1. This is about LED retrofit l.s. as legal and equivalent replacement parts for R37 l.s.
   • Therefore LED retrofit l.s. should be approved but to R128.
2. Equivalence criteria are being developed in the TF LED of WG LS
   • Will be used for defining LED retrofit category sheets for R128
   • Will not be implemented into R128
   • Similar as the criteria tool for filament lamps for head lighting
   • May be inserted in the “reference documents” section of the GRE
   • Available to all participants to GRE
3. The category designation will be the same as of the corresponding filament lamp
   • To clarify that LED retrofit categories are equivalent retrofits
   • To avoid confusion: R37 category is marked on the lenses of signal lamps
   • Additional marking “R” (incl. “””) to indicate as retrofit
     •Disconnected from other markings and category designation
     • A similar marking is the U marking for UV requirements
4. Every replaceable approved I.s. is basically also a retrofit product/ replacement part
   - LED retrofit categories replace filament lamps (another technology)
     - This is additional reason for “R”-marking in R128
5. Standard “R”-marked LED light sources
   - Not available for type approval of new lamps nor for COP purposes of lamps
     - The intention is retrofit
     - Wattage lower than R37 I.s.
       (max. wattage R128 light source up to max wattage of R37 light source)
6. Introduce groups of categories in R128 such as in R37
7. New group for “R”-marked lamps
   - Group 4 “Light sources not available for approval of new lamps”
   - Insert new paragraph “9. retrofit provisions”
ADMINISTRATIVE PROVISIONS (AMEND)

“2.3.3. LED light sources of categories listed in the table for group 4 in annex 1 shall be marked with an “R” including the inverted commas, and shall be disconnected from other markings.

2.3.4. Inscriptions other than those covered by paragraphs 2.3.1. and 2.4.4. may be affixed, on the condition that they do not adversely affect the luminous characteristics.”

TRANSITIONAL PROVISIONS (NEW)

“8. RESERVED”


RETROFIT PROVISIONS (NEW)

“9. Retrofit provisions
9.1. No “R “marked LED light sources shall be used in lamps for type approval purposes.
9.2. No “R “marked LED light sources shall be used for conformity of production control purposes of lamps.
9.3. For lamps installed on vehicles in use, “R “marked LED light sources are deemed to be replacement parts to light sources with the same category designation but approved according Regulation[s] No. 37 [or 99].”
Regulation No. 128

**LED LIGHT SOURCE CATEGORY LISTINGS (NEW)**

Annex 1

The *List of categories of LED light sources and their sheet numbers*, amend to read:
“List of categories of LED light sources, grouped and their sheet numbers”

### Group 1

**Without general restrictions:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Sheet number(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“RESERVED”</td>
<td></td>
</tr>
</tbody>
</table>

### Group 2

**Only for use in signalling lamps, cornering lamps, reversing lamps and rear registration plate lamps:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Sheet number(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR1</td>
<td>LR1/1 to 5</td>
</tr>
<tr>
<td>LW2</td>
<td>LW2/1 to 5</td>
</tr>
</tbody>
</table>

### Group 3

RESERVED
LED LIGHT SOURCE CATEGORY SHEETS

Comments:

The maximum value of the objective wattage of an LED category having the same designation as a particular category in R37, might be equal to the maximum value of the objective wattage of the R37 category.

Testing of group 4 light sources not yet included in this text.
Device regulations

1. No amendment necessary.
   - “R”-marked light sources are intended for the aftermarket
   - “Regular” R128 categories are for OEM
   - The reference to use restrictions in Regulation No. 128 approved by WP.29
     WP.29/2012/63, WP.29/2012/64, WP.29/2012/65, WP.29/2012/68, WP.29/2012/71,
     WP.29/2012/75, WP.29/2012/77, WP.29/2012/78, WP.29/2012/79
   - “R”-marked light sources are not for type approval of lamps nor for COP
R48

1. For type approval acc. to R48 amendment is not needed

BUT

2. There is no requirement that approved lamps installed on vehicles shall use light sources for which these lamps have been approved
   • Possible negative consequences: GRE-69-41, WP.29-156-08

3. Such requirement should be introduced
   • The only exemption: “R”- marked LED light sources
   • Regulation No. 48 is often used for reference purposes from national law for permanent requirements; GRE-69-41, WP.29-156-08
Retrofit provisions

Lamps installed on vehicles [(in use)] and approved for use with light source(s) according to Regulations No. 37, 99 or 128 shall be equipped with light sources of the categories for which the lamp was approved. However, lamps installed on vehicles [(in use)] and approved for use with light source(s) according to Regulations No. 37 or 99 may also be equipped with “R” marked LED light sources with the same category designation as of these filament or gas discharge light source(s), but according to Regulation No. 128.”
1. For type approval according to R37 amendment is not needed.

BUT

2. For clarity it may be better to specify in R37
   1. Light source categories of the same designation appear in R128
   2. To explain such categories are legal replacement parts, too.
"9. Retrofit provisions

9.1. For lamps installed on vehicles in use, “R marked” LED light sources approved according to Regulation No. 128 are deemed to be replacement parts to light sources with the same category designation but approved according this Regulation.

"
We would appreciate your valuable input and guidance.

THANK YOU
BACK UP LED RETROFIT

Taken from: GRE-69-41 and WP29-156-08e
“Feasibility of LED retrofit”

With reference to

“Replacement light sources and compliance”
GRE-66-19; WP.29-156-08

on one hand:

there are worries about

• non-approved light sources,
• including non-approved LED retrofits
on the other hand:

- The public is stimulated to apply energy saving products in *general* lighting

- But is not aware that *automotive* LED retrofits are non-approved light sources

Today, there are *no legal energy saving replacement light sources for vehicles available*
"Feasibility of LED retrofit"

New work item

To investigate feasibility of new LED categories according to R128, as replacement parts for filament light source categories according to R37.*

Study should include:

- Development of equivalence criteria
- Investigation on how to implement retrofit provisions in the relevant UN regulations

*GTB document CE-4792
Conditions for equivalent performance

R37 light source

“Identical”

performance based and prescriptive criteria

- Luminous flux
- Light emission characteristics
- Colour of the light emitted
- Geometry of light emitting area
- Maximum outline
- Wattage (≤)
- IEC cap/holder system

R128-retrofit

Light emitting area

GTB Document CE-4930 rev.1
“Bad” bulbs
One effect of displacement of the filament:

\[ \Delta \text{visibility range} \]

\[ \sim -30 \text{ m} \]
Another effect of displacement of the filament:

\[ \Delta \text{glare} \]
“Bad” beam pattern

Low beam range

Low beam range

High glare level
LED retrofit in signal lighting example

approved filament lamp vs. non-approved LED retrofit

- Luminous output: ok vs. not sufficient
- Red color: ok vs. ok
- Emitter size: 4mm vs. 12mm (too large)
- Intensity distribution: ok vs. does not fit to optical system
LED retrofit in front lighting example

approved halogen light source vs. non-approved LED retrofit

- Luminous output: 1100lm vs. 67lm
- Color of light: 3200K vs. 9300K (outside boundaries for white)
- Emitter size: 4mm vs. 20mm
- Intensity distribution: circular vs. non-symmetrical
END