

GRE TF S/R: Options for LED Retrofits

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2019-01-30

General

Option 1: All parameters equivalent

PRO: easy to use, „plug-and-play“

CON: too complex for today technology, limited energy saving potential

Option 2: Few parameters not equivalent, combined with customer information

PRO: achievable with today technology, high energy saving potential

CON: consumer education required, users must follow „instructions for use“

LED „Substitute“ parameters → already equivalent

- Photometric and colorimetric
 - Luminous flux
 - Intensity distribution
 - Position and characteristics of LEA
 - Color, especially limit white to <3000K (for signaling light sources)
- Geometric / mechanical
 - Maximum outline dimensions
 - Light Center Length
 - Cap/holder system
 - *Maximum weight (IEC 60810)*
- Electrical
 - Connector
 - Test voltage incl. range (9 to 14V)
 - EMC (according to R10)
 - No light in first 2ms
- Thermal
 - Testing at 80°C ambient
 - 1min / 30 min ratio
 - Base temperature (via maximum wattage)

LED „Substitute“ parameters → not yet equivalent

- Electrical

- Typical power consumption (*for failure detection based on typical filament behaviour*)

- impact: potentially “false” failure message

- PWM dimming behavior (*dual function use of a single filament e.g. tail/stop with P21W*)

- impact: potentially wrong operation of minor function

- Thermal

- Performance at very high ambient temperature (*e.g. above a high-wattage light source in the same cavity*)

- impact: potentially early failure

Conclusion for the Retrofit-case

Option 1: All parameters equivalent

→ need to „solve“ the three „not yet equivalent“ items

Option 2: Few parameters not equivalent

→ combine with customer information / warning message

→ address the three „not yet equivalent“ items in the user instructions

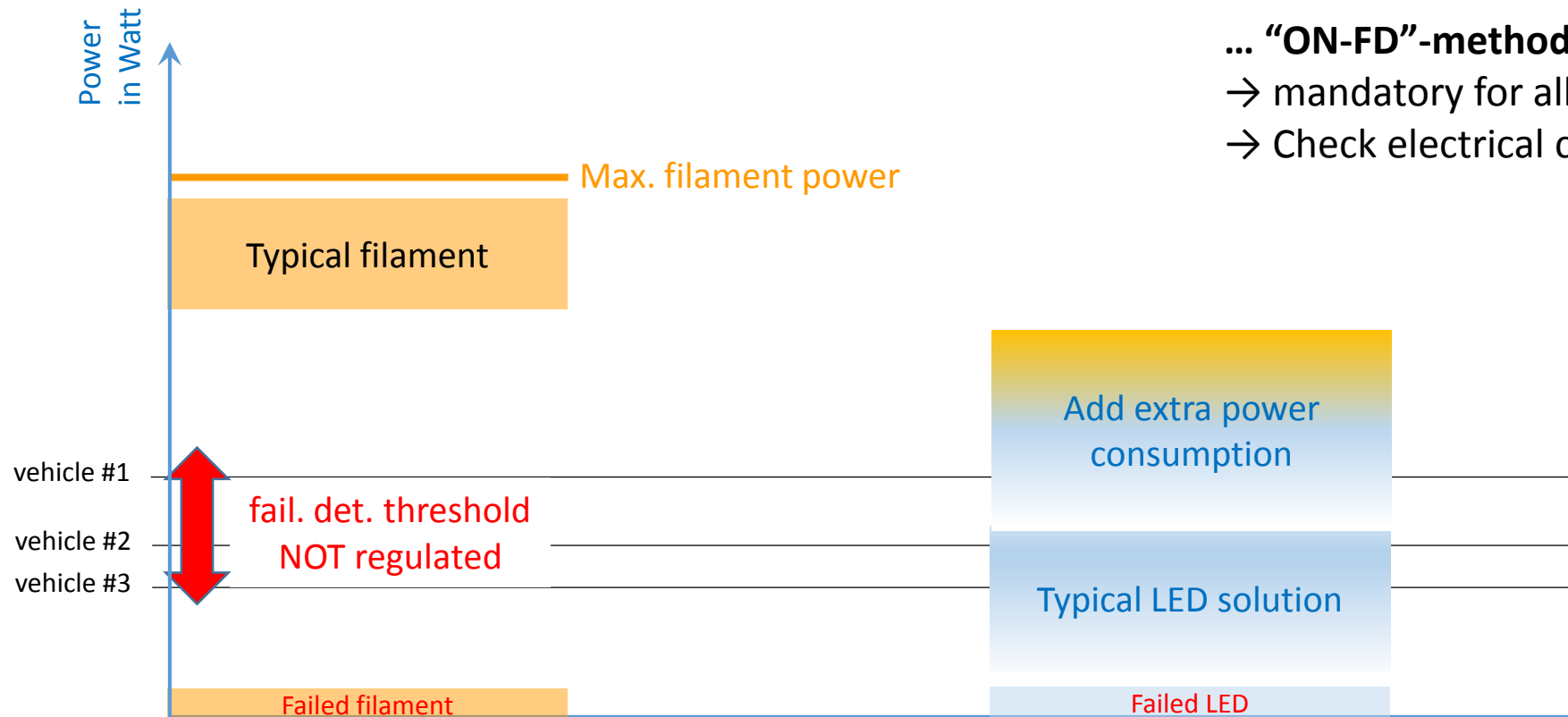
The choice between Option 1 and Option 2 could be light source category specific.

Possible options for legal use of LED Retrofits

1. R37 light source approval
2. R128 light source approval + national/regional permission for the use
3. National/regional solutions

Back-up Material “Failure Detection System”

Most common failure detection method ...



... "ON-FD"-method

- mandatory for all direction indicators
- Check electrical current/power when switched ON

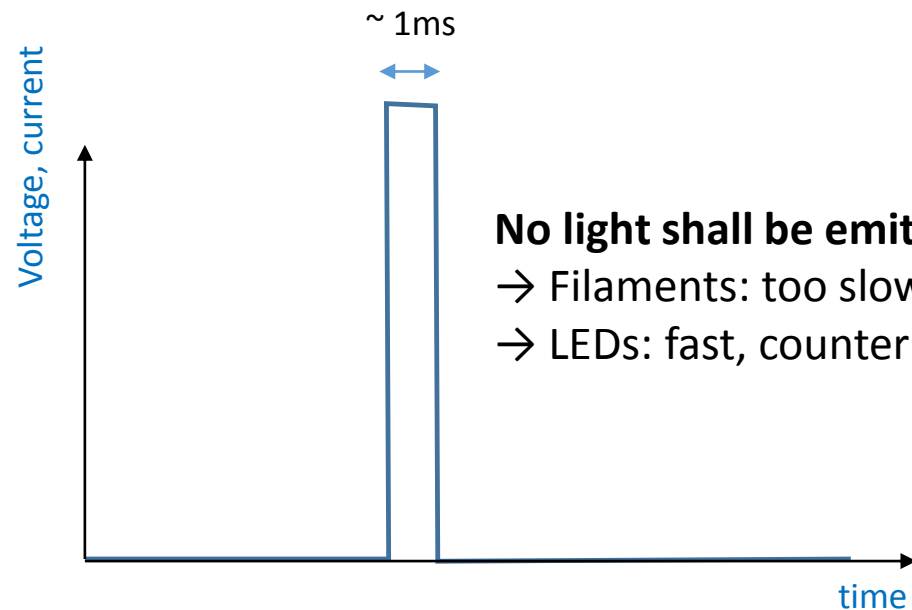
- Only max. filament power defined, but ...
- Filament physics give typical range

- If FDS present, then LED replacement solutions do not work properly in all vehicles
- artificially increase power consumption ??
- ... loss of CO2 emission reduction

... also used: Presence check when off ...

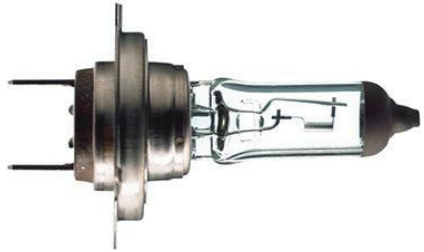
... “OFF-FD”-method

- comfort function in some functions/vehicles
- apply short voltage pulse, detect current



For Substitutes, it has been solved.
Will be taken over and solved for Retrofits, too.

Filament based functions → Situation on (in) the road (market)



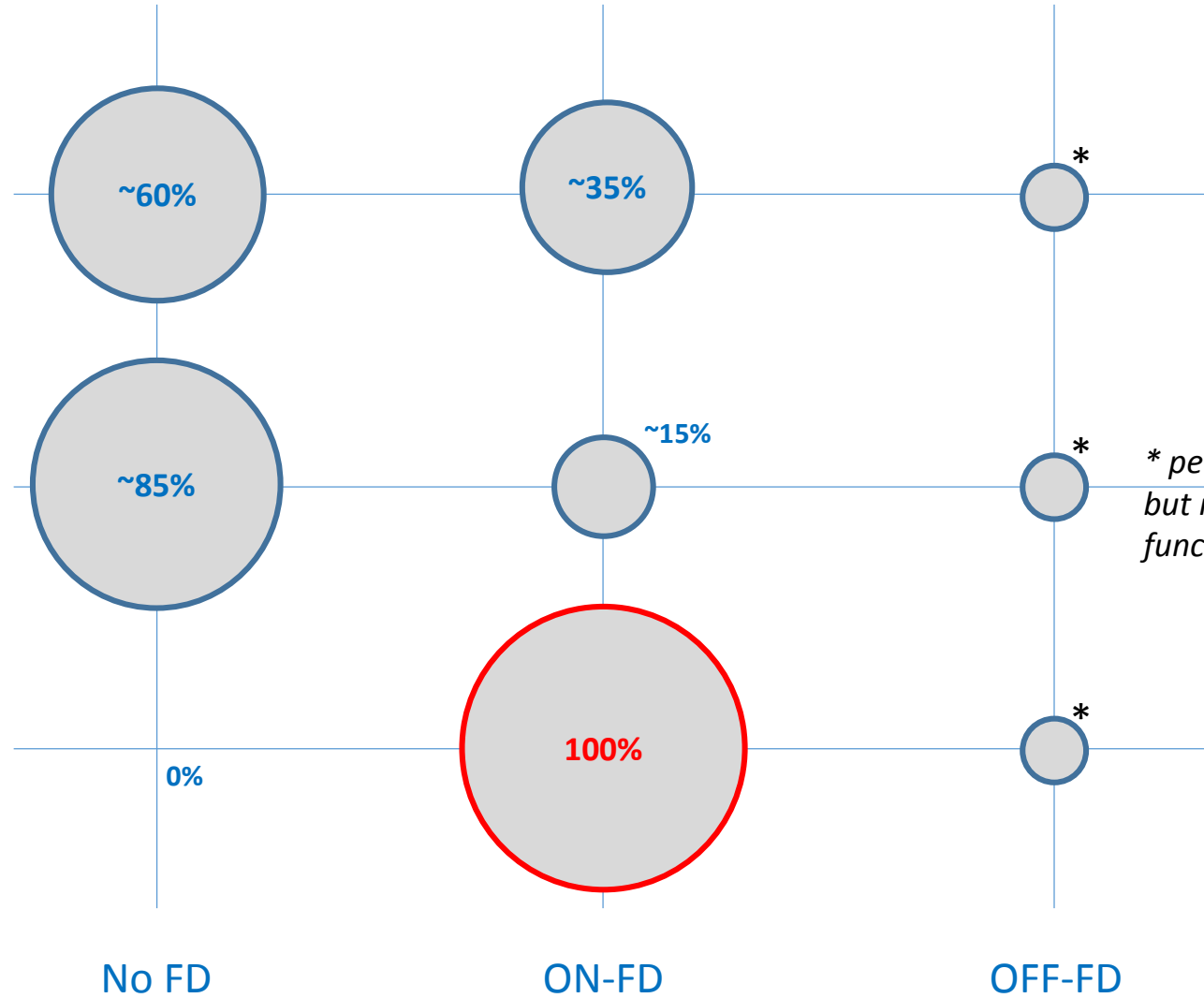
Low beam



License plate illumination



Direction indicator



* penetration numbers low but not known, this comfort function is anyhow solved

- Mandatory failure detection
- Optional failure detection

