

# Luminance threshold for apparent surfaces

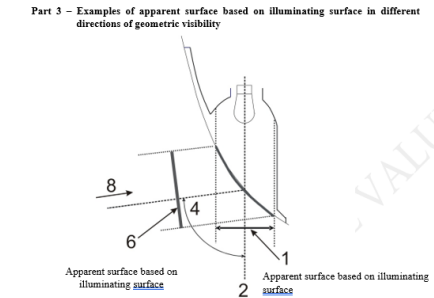
*Ingolstadt, 2024.03.20*

## *Luminance threshold for apparent surfaces*

- The apparent surface of a lamp shall provide a minimum surface of at least 12.5 cm<sup>2</sup> within the angles of geometric visibility of a lamp.
  - Direction indicators, front position lamp, rear position lamp
  - To be considered visible, the lamp shall provide an unobstructed view of the apparent surface of at least **12.5 square centimetres**, ...
- The requirements for light intensity in R148 define a minimum light distribution of these functions within the angle of geometric visibility:
  - Front and rear position lamp Table 3 →  $5 \cdot 10^{-2} \text{ cd} = 0,05 \text{ cd}$
  - Direction indicator lamps Table 8 →  $3 \cdot 10^{-1} \text{ cd} = 0,3 \text{ cd}$

## Luminance threshold for apparent surfaces

- The intensity and size restrictions account for an average luminance of the area of a direction indicator and of a position lamp of
- Front and rear position lamp  $0,05 \text{ cd}/12,5 \text{ cm}^2 = 40 \text{ cd/m}^2$
- Direction indicator lamp  $0,3 \text{ cd} / 12,5 \text{ cm}^2 = 240 \text{ cd/m}^2$
- When a threshold of  $500 \text{ cd/m}^2$  applies to all area evaluation, the minimum requirements for light intensity from the minimum area provided are significantly raised.
- $0,05 \text{ cd}$  becomes  $0,625 \text{ cd} \rightarrow 12,5 \text{ times higher}$
- $0,3 \text{ cd}$  becomes  $3,75 \text{ cd} \rightarrow 12.5 \text{ times higher}$
- This is a significant increase of regulatory requirements! The SLR is a forum for simplification, so a compensation was needed because I cannot see why such significant increase should be justified.

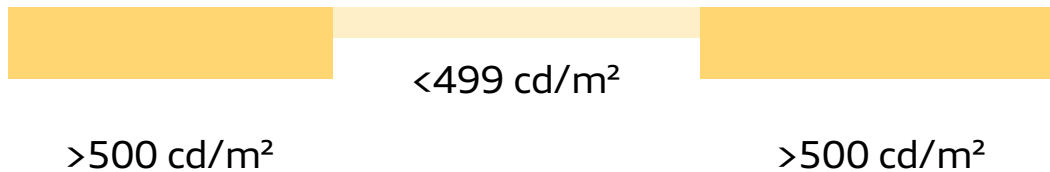


## *Luminance threshold for apparent surfaces*

- Some distance requirements e.g. the 75mm requirements are based on the evaluation of a vague boundary definition for the apparent surface.
- With a precise definition of the luminance threshold of the boundary, this does no longer apply so all position and distance requirements must be modified to show the same level of regulatory requirements.
- The 75 mm for example was the result of 150 mm minus uncertainty about the boundary condition to the value must be raised to the base line of 150 mm.

## *Luminance threshold for apparent surfaces*

- A high luminance threshold has the effect, that a significant light intensity may be generated outside of the apparent surface.
- This needs discussion, because some boundaries shall separate lighted areas e.g. between left and right direction indicators.
- With the new definition, a direction indicator in the form of a band or stripe is possible with a central area with a luminance of up to 499 cd/m<sup>2</sup>



## *Luminance threshold for apparent surfaces*

- The height requirements for apparent surface shall guarantee a lamp within the boundaries of visibility to other road users.
- With a high luminance threshold lamps may be installed with large areas of light intensity outside of the lower and upper height limits which interferes with the visibility.



Most light to the test grid may be produced outside of the height restrictions

## *Luminance threshold for apparent surfaces*

- A high luminance threshold may force manufacturers to reduce the size of their signal lamps.
- Manufacturers tend to design lamps to have a uniform luminance across their lighted areas.
- The maximum intensity of a rear position lamp of 17cd with a 500 cd/m<sup>2</sup> limit for the apparent surface means that the lamp must not show an area of more than 340 cm<sup>2</sup> and this is not very much for a lamp in the form of a band.
- A band of 1280 cm length ( vehicle 2m wide, max distance 400mm → 1200 cm safety tolerance 4 cm each) cannot show a width of more than 2 cm. A lamp with less than the max intensity e.g. at 8.5 cd which is still far double of the minimum value of 4 cd may only show 1 cm width.
- Rearward facing parking lamps with a maximum intensity of 3 cd must not show an area of more than 60 cm<sup>2</sup>, an average lamp of 2 cd only 30 cm<sup>2</sup> so it might not be allowed to show the same design as the position lamp.
- The luminance method with such high luminance threshold introduces unnecessary design restrictions.

## *Luminance threshold for apparent surfaces*

- A high luminance threshold may lead to the problem that lamps do not have an apparent surface at all.
- How shall the installation position be evaluated then?
- Side marker lamps SM2 have a minimum intensity of 0.6 cd in the direction of the reference axis.
- A side marker lamp larger than 12 cm<sup>2</sup> has an average luminance below 500cd/m<sup>2</sup>.
- Such lamp may not have an apparent surface at all. → Must a lamp have an apparent surface?
- Then the threshold introduces new requirements.
- If a lamp has no apparent surface, how can a technical service judge the location of the lamp?



## *Luminance threshold for apparent surfaces*

- Does an observer need the precise definition of the boundary of an apparent surface?
- I think the discussion deviates very much from the scope of the regulation.
- Take the Scope of the width information by position lamps and the influence of the new definition on the quality of information for an external observer:
  - The distance between the outer boundary of a vehicle and the outer boundary of the apparent surface may be 400 mm plus the width of e.g. mirrors extending outside of such boundary.
  - Then, an external observer receives an information about the width of the vehicle with a tolerance of 1m which is 500mm per side.
  - A driver must keep a safety distance from other traffic of e.g. 1 m so the target location of the driver will be 1.5m outside of the outer boundary of the position lamps apparent surface.
  - Such observer does not get any significant improvement from a precise evaluation of the outer boundary position that reduces this target by e.g. 2 cm for worst cases of questionable definitions to the current criteria.
  - Instead of 1.5m outside of the apparent surface the target position is 1.48 m outside.
  - The observer will not steer the vehicle with a tolerance of 2 cm anyway and the effect is less than 1.5%.