

Lightness L^*_Z for surround mean grey Z (sRGB)

For separated surface colours in the range $3,6 < Y < 90$

or the digital range $100/255 = 0,39 < Y < 100$ it is valid:

$$L^*_Z = a (Y/Y_n)^k \quad [1] \quad a=100; Y_n=100; k=0,42=1/2,4$$

$$= b (Y/Y_u)^k \quad [2] \quad b=a(Y_u/Y_n)^k=50; Y_u=18$$

For $Y=Y_u$ it is valid: $L^*_{Zu}=50$.

Derivation of equation [2] gives with $1-k = 0,58$:

$$\delta(L^*_Z)/\delta Y = c (Y/Y_u)^{1-k} \quad [3] \quad c = (b k)/Y_u = 21/18 = 1,17$$

or for the threshold $\delta(L^*_Z)=1$

$$\delta Y = d (Y/Y_u)^{1-k} \quad [4] \quad d = Y_u/(b k) = 18/21 = 0,86$$

For the surround lightness $L^*_{Zu} = 50$ with $Y=Y_u$ the threshold is:

$\delta Y_{Zu} = 0,86$. This threshold is *independent* of k .