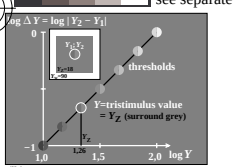
http://farbe.li.tu-berlin.de/eej0/eej0/0n1.txt /.ps; only vector graphic VG; start output
see separate images of this page: http://farbe.li.tu-berlin.de/eej0/eej0.htm

see similar files of the whole serie: http://farbe.li.tu-berlin.de/eejs.htm
technical information: http://farbe.li.tu-berlin.de or http://color.li.tu-berlin.de

TUB registration: 20230701-eej0/eej0/0n1.txt /.ps
application for evaluation and measurement of display or print output

TUB material: code=fha4ta



sensation scaling functions
lightness L^* and tristimulus value Y
adaptation on surround white W

$$L^*_W = 100\ (\ Y\ /\ 100)^{1/2,0}$$

adaptation on surround grey Z

$$L^*_Z = 100\ (\ Y\ /\ 100)^{1/2,4}$$

description with CIELAB 1976

$$L^*_{CIELAB} = 116\ (\ Y\ /\ 100)^{1/3,0} - 16$$

adaptation on surround black N

$$L^*_N = 100\ (\ Y\ /\ 100)^{1/3,0}$$

Weber-Fechner law in CIE 230:2019 for threshold colour differences of surface colours; relations between tristimulus value, lightness and luminance

The Weber-Fechner law describes the lightness L^*, an *logarithmic* function of L. The Stevens law describes the lightness L^*_{CIELAB}, an *potential* function of L, $^{[5]}$ ISO 11664-2:1 uses a similar potential function $L^*_{lin} = a\ L^{1/3}$.

The Weber-Fechner law is equivalent to the equation: $\Delta L_r = c\ L_r$ [1]
Integration leads to the logarithmic equation: $L^* = k\ \log(L_r)$ [2]
Derivation leads for ΔL^*=1 to the linear equation: $L/\Delta L_r = k = 57$. [3]
For **Adjacent** colours in office the standard contrast range is 25:1=90:3,6.

Table 1: CIE tristimulus value Y, luminance L_r and lightness L^*

Colour (matte) (contrast)	Tristimulus value Y 25:1=90:3,6	office luminance L_r [cd/m²]	relative luminance $L_r/L_{r,w}$	CIELAB lightness L^*_{CIELAB} a_{CIELAB}=116 $(Y/100)^{1/3,0}$ − 16	TUBIND lightness L^*_{TUBIND} a_{TUBIND}=100 $(Y/100)^{1/2,0}$
White W	90	142	1	94	100
paper	=10^95	=28,2^5	5	=>94	=>100
Grey Z	18	28,2	1	50	64
paper				=50	=>50
Black N	3,6	5,6	0,2	18	40
paper	=10^5	=28,2^5		=>20 -32	=>40 |log(0,2)

For the lightness range between L^*_W= 40 and 40 the constant is: k=40/log(5)=57

eejd0n-3a