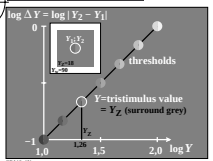
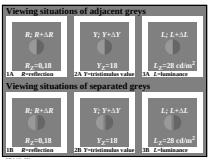
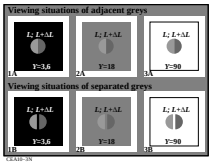
see similar files: http://farbe.li.tu-berlin.de/CEA1/CEA1.HTM
technical information: http://farbe.li.tu-berlin.de or http://color.li.tu-berlin.de



CEA10–1N



CEA10–2N



CEA10–3N

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

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

CEA10–4N

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

For separated surface colours in the range 0,0036<R<0,90
or the digital range 1/255<0,0039<R<1,00 it is valid:

$L^*_Z = a\,(R/R_n)^b$ [1] a=100; R_n=1,00; b=0,42=1/2,4
$= b\,(R/R_n)^k$ [2] b=a·(R_n/R_n)^k=50; R_n=0,18

For R=R_n it is valid: L^*_{Zn}=50.

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

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

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

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

For the surround lightness L^*_{Zn} = 50 with R=R_n the threshold is:
$\delta R_{Zn} = 0{,}86$. This threshold is *independent* of k.

CEA11–1N

Lightness L^*_{JND} for the Just Noticeable Difference (JND)

For adjacent surface colours in the range 0,0036<R<0,90
or the digital range 1/255<0,0039<R<1,00 it is valid:

$L^*_{JND} = a\,(R/R_n)^b$ [1] a=5572; R_n=1,00; b=0,14=1/7,2
$= b\,(R/R_n)^k$ [2] b=a·(R_n/R_n)^k=450; R_n=0,18

For R=R_n it is valid: L^*_{JNDn}=450.

Derivation of equation [2] gives with $1-k = 0{,}86$:

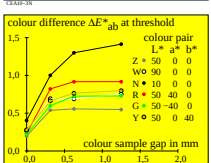
$\delta(L^*_{JND})/\delta R = c\,/\,(R/R_n)^{1-k}$ [3] $c = (b\,k)/R_n = 63/18 = 3{,}5$

or for the threshold $\delta(L^*_{JND})$=1

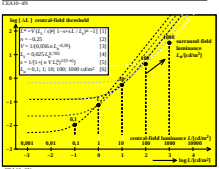
$\delta R = d\,/\,(R/R_n)^{1-k}$ [4] $d = R_n/(b\,k) = 18/63 = 0{,}29$

For the surround lightness L^*_{JNDn}=450 with R=R_n the threshold is:
$\delta R_{JNDn} = 0{,}29$. This threshold is *independent* of k.

CEA11–2N



CEA10–5N



CEA10–6N

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:

$L^*_Z = a\,(Y/Y_n)^b$ [1] a=100; Y_n=100; b=0,42=1/2,4
$= b\,(Y/Y_n)^k$ [2] b=a·(Y_n/Y_n)^k=50; Y_n=18

For Y=Y_n it is valid: L^*_{Zn}=50.

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

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

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

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

For the surround lightness L^*_{Zn} = 50 with Y=Y_n the threshold is:
$\delta Y_{Zn} = 0{,}86$. This threshold is *independent* of k.

CEA11–3N

Lightness L^*_{JND} for the Just Noticeable Difference (JND)

For adjacent surface colours in the range 3,6<Y<90
or the digital range 100/255<0,39<Y<100 it is valid:

$L^*_{JND} = a\,(Y/Y_n)^b$ [1] a=5572; Y_n=100; b=0,14=1/7,2
$= b\,(Y/Y_n)^k$ [2] b=a·(Y_n/Y_n)^k=450; Y_n=18

For Y=Y_n it is valid: L^*_{JNDn}=450.

Derivation of equation [2] gives with $1-k = 0{,}86$:

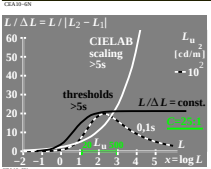
$\delta(L^*_{JND})/\delta Y = c\,/\,(Y/Y_n)^{1-k}$ [3] $c = (b\,k)/Y_n = 63/18 = 3{,}5$

or for the threshold $\delta(L^*_{JND})$=1

$\delta Y = d\,/\,(Y/Y_n)^{1-k}$ [4] $d = Y_n/(b\,k) = 18/63 = 0{,}29$

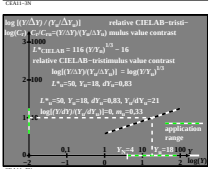
For the surround lightness L^*_{JNDn}=450 with Y=Y_n the threshold is:
$\delta Y_{JNDn} = 0{,}29$. This threshold is *independent* of k.

CEA11–4N

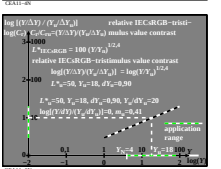


CEA10–7N

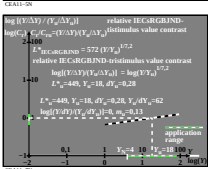
CEA10–8N



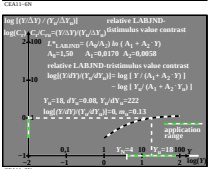
CEA11–5N



CEA11–6N



CEA11–7N



CEA11–8N

input: *rgb/cmy0/000k/n*