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

TUB registration: 20241001-heo5/heo5l0np.pdf /.ps
application for evaluation and measurement of display or print output

TUB material: code=rha4ta

log (L*/L*_u) IECsRGB lightness L* normalized to the background lightness L*_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/2,4, d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 48,94, L^*_u = r - d$) [1b]
$L^*/L^*_u = (Y/Y_u)^n$ [1c]
$\log(L^*/L^*_u) = n \log(Y/Y_u)$ [1d]
$\ln(L^*/L^*_u) = \ln(10)\, n \log(Y/Y_u)$ [1e]
$L^*/L^*_u = e^{\ln(10)\, n \log(Y/Y_u)}$ [1f]

$m_{nu} = n = 0,416$
$m_u = 0,416$
0,301
−0,532
application range

log (ΔY/ΔY_u) IECsRGB tristimulus value difference ΔY normalized to ΔY_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/2,4, d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 48,94, L^*_u = r - d$) [1b]
$dY = [Y_n/(n\,s)]\,(Y/Y_n)^{1-n}$ [2c]
$dY_u = [Y_n/(n\,s)]\,(Y_u/Y_n)^{1-n} = 1,1746$ [2d]
$dY/dY_u = (Y/Y_u)^{1-n}$ [2e]
$\log(dY/dY_u) = (1-n)\log(Y/Y_u)$ [2f]

$m_{nu} = 1 - n = 0,583$
$m_u = 0,583$
0,421
−0,745
application range

L*/L*_u IECsRGB lightness L* normalized to the background lightness L*_u

$m_{u90\_4} = 0,808, f_{90}=95, f_4=26$
$m_u = 1,098$
2,000
0,293
application range

ΔY/ΔY_u IECsRGB tristimulus value difference ΔY normalized to ΔY_u

$m_{u90\_4} = 0,021, f_{90}=2, f_4=0$
$m_u = 0,027$
2,639
0,179
application range

log[(ΔY/Y)/(ΔY/Y)_u] IECsRGB-Y sensitivity normalized to (ΔY/Y)_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/2,4, d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 48,94, L^*_u = r - d$) [1b]
$dY/Y = [Y_n/(n\,s)]\,(Y/Y_n)^{1-n}/Y$ [3c]
$(dY/Y)_u = [Y_n/(n\,s)]\,(Y_u/Y_n)^{1-n}/Y_u$ [3d]
$(dY/Y)/(dY/Y)_u = (Y/Y_u)^{-n}$ [3e]
$\log[(dY/Y)/(dY/Y)_u] = (-n)\log(Y/Y_u)$ [3f]

$m_{nu} = -n = -0,416$
$m_u = -0,416$
0,532
−0,301
application range

log[(Y/ΔY)/(Y/ΔY)_u] IECsRGB-Y contrast normalized to (Y/ΔY)_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/2,4, d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 48,94, L^*_u = r - d$) [1b]
$Y/dY = Y/\{[(Y_n/(n\,s))(Y/Y_n)^{1-n}]\}$ [4c]
$(Y/dY)_u = Y_u/\{[(Y_n/(n\,s))(Y_u/Y_n)^{1-n}]\}$ [4d]
$(Y/dY)/(Y/dY)_u = (Y/Y_u)^n$ [4e]
$\log[(Y/dY)/(Y/dY)_u] = (n)\log(Y/Y_u)$ [4f]

$m_{nu} = n = 0,416$
$m_u = 0,416$
0,301
−0,532
application range

(ΔY/Y)/(ΔY/Y)_u IECsRGB-Y sensitivity normalized to (ΔY/Y)_u

$m_{u90\_4} = -0,000, f_{90}=0, f_4=0$
$m_u = -0,001$
3,406
0,499
application range

(Y/ΔY)/(Y/ΔY)_u IECsRGB-Y contrast normalized to (Y/ΔY)_u

$m_{u90\_4} = 0,336, f_{90}=39, f_4=10$
$m_u = 0,457$
2,000
0,293
application range

log (L*/L*_u) TUBsRGB lightness L* normalized to the background lightness L*_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$L^*/L^*_u = (Y/Y_u)^{1/\ln(10)}$ ($\ln(x) = \ln(10)\log(x)$) [1c]
$\log(L^*/L^*_u) = (1/\ln(10))\log(Y/Y_u)$ [1d]
$\ln(L^*/L^*_u) = \log(Y/Y_u)$ [1e]
$L^*/L^*_u = e^{\log(Y/Y_u)}$ [1f]

$m_{nu} = n = 0,434$
$m_u = 0,434$
0,301
−0,567
application range

log (ΔY/ΔY_u) TUBsRGB tristimulus value difference ΔY normalized to ΔY_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$dY = [Y_n/(n\,s)]\,(Y/Y_n)^{1-n}$ [2c]
$dY_u = [Y_n/(n\,s)]\,(Y_u/Y_n)^{1-n} = 1,0934$ [2d]
$dY/dY_u = (Y/Y_u)^{1-n}$ [2e]
$\log(dY/dY_u) = (1-n)\log(Y/Y_u)$ [2f]

$m_{nu} = 1 - n = 0,565$
$m_u = 0,565$
0,391
−0,739
application range

L*/L*_u TUBsRGB lightness L* normalized to the background lightness L*_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$L^*/L^*_u = (Y/Y_u)^{1/\ln(10)}$ ($\ln(x) = \ln(10)\log(x)$) [1c]

$m_{u90\_4} = 0,823, f_{90}=95, f_4=24$
$m_u = 1,111$
2,000
0,270
application range

ΔY/ΔY_u TUBsRGB tristimulus value difference ΔY normalized to ΔY_u

$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$dY = [Y_n/(n\,s)]\,(Y/Y_n)^{1-n}$ [2c]
$dY_u = [Y_n/(n\,s)]\,(Y_u/Y_n)^{1-n} = 1,0934$ [2d]
$dY/dY_u = (Y/Y_u)^{1-n}$ [2e]

$m_{u90\_4} = 0,020, f_{90}=2, f_4=0$
$m_u = 0,026$
2,464
0,182
application range

log[(ΔY/Y)/(ΔY/Y)_u] TUBsRGB-Y sensitivity normalized to (ΔY/Y)_u

$S_r/S_{ru} = (ΔY/Y)/(ΔY/Y)_u$
$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$dY/Y = [Y_n/(n\,s)]\,(Y/Y_n)^{1-n}/Y$ [3c]
$(dY/Y)_u = [Y_n/(n\,s)]\,(Y_u/Y_n)^{1-n}/Y_u$ [3d]
$(dY/Y)/(dY/Y)_u = (Y/Y_u)^{-n}$ [3e]
$\log[(dY/Y)/(dY/Y)_u] = (-n)\log(Y/Y_u)$ [3f]

$m_{nu} = -n = -0,434$
$m_u = -0,434$
0,567
−0,300
application range

log[(Y/ΔY)/(Y/ΔY)_u] TUBsRGB-Y contrast normalized to (Y/ΔY)_u

$C_r/C_{ru} = (Y/ΔY)/(Y/ΔY)_u$
$L^* = s(Y/Y_n)^n - d$ ($Y_n=100, Y_u=18, s=100, n=1/\ln(10), d=0$) [1a]
$L^* = r(Y/Y_u)^n - d$ ($r = s(Y_u/Y_n)^n = 47,48, L^*_u = r - d$) [1b]
$Y/dY = Y/\{[(Y_n/(n\,s))(Y/Y_n)^{1-n}]\}$ [4c]
$(Y/dY)_u = Y_u/\{[(Y_n/(n\,s))(Y_u/Y_n)^{1-n}]\}$ [4d]
$(Y/dY)/(Y/dY)_u = (Y/Y_u)^n$ [4e]
$\log[(Y/dY)/(Y/dY)_u] = (n)\log(Y/Y_u)$ [4f]

$m_{nu} = n = 0,434$
$m_u = 0,434$
0,300
−0,567
application range

(ΔY/Y)/(ΔY/Y)_u TUBsRGB-Y sensitivity normalized to (ΔY/Y)_u

$m_{u90\_4} = -0,000, f_{90}=0, f_4=0$
$m_u = -0,001$
3,697
0,500
application range

(Y/ΔY)/(Y/ΔY)_u TUBsRGB-Y contrast normalized to (Y/ΔY)_u

$m_{u90\_4} = 0,358, f_{90}=41, f_4=10$
$m_u = 0,483$
1,998
0,270
application range

heo50-1a heo50-2a heo51-1a heo51-2a
heo50-3a heo50-4a heo51-3a heo51-4a
heo50-5a heo50-6a heo51-5a heo51-6a
heo50-7a heo50-8a heo51-7a heo51-8a
heo50-3n heo50-7n heo51-3n heo51-7n

TUB-test chart heo5; IECsRGB & TUBsRGB colour-difference, IEC 61966-2-1 & TUBsRGB 2025
log & lin[lightness L*, threshold ΔY, sensitivity ΔY/Y, contrast Y/ΔY, normalized for grey U]