hue circle   24 steps, rgb_d

BEA60−1N

hue circle   24 steps, names

BEA60−2N

Achromatic colours, intermediate colours	Chromatic colours, elementary colours	chromatic colours, device colours
five achromatic colours:	**"neither-nor"-colours**	**TV, print (PR), photo (PH)**
	four elementary (e) colours:	*six device (d) colours:*
N black (French noir)	$R = R_e$ red	$C = C_d$ cyan blue (cyan)
D dark grey	*neither yellowish nor bluish*	$M = M_d$ magenta red (magenta)
Z central grey	$G = G_e$ green	$Y = Y_d$ yellow
L light grey	*neither yellowish nor bluish*	$O = R_d$ orange red (red)
W white	$B = B_e$ blue	$L = G_d$ leaf green (green)
two intermediate colours:	*neither greenish nor reddish*	$V = B_d$ violet blue (blue)
$C_b = G50R_b$ blue-green	$J = Y_e$ yellow (French jaune)	
$M_b = B50R_b$ blue-red	*neither greenish nor reddish*	

BEA60−3N

NW-achromatic, and *RG*- and *YB*-chrom. thresholds as function of *Y*

experiments and data: BAM-research report no. 115 (1985), page 72, see
https://nbn-resolving.org/urn:nbn:de:kobv:b43-3350

tristimulus value threshold ΔY
RG-chromaticity threshold $\Delta a \cdot Y$ $\Delta b \cdot Y$ *YB*-direction
YB-chromaticity threshold $\Delta b \cdot Y$ $\Delta a \cdot Y$ *RG*-direction
$\Delta a = x_1 / y_1 - x_2 / y_2$ ΔY *NW*-direction
$\Delta b = z_1 / y_1 - z_2 / y_2$

$\Delta Y = Y_2 - Y_1$
Y_1 Y_2
Y_u
Y_w

$\Delta Y = s + c \cdot Y = 0,017 + 0,0058\ Y$
Y_u tristimulus value of grey surround

$x = \log Y$

BEA60−7, B4_70

Colour–difference formula LABJND 1985 (JND=just noticeable difference)

$$\Delta E^*_{JND} = \Delta E^*_{85} = A_0\,[\,(\Delta\,Y)^2 + (A_3\,\Delta\,a''\cdot Y)^2 + (A_4\,\Delta\,b''\cdot Y)^2\,]^{1/2} / (A_1 + A_2\cdot Y)$$

$a = x/y$ $a_n = x_n / y_n$ $b = -0,4\ z/y$ $b_n = -0,4\ z_n / y_n$

$a'' = a_n + (a - a_n) / (1 + 0,5\ |a - a_n|)$ n = D65 or A (background)

$b'' = b_n + (b - b_n) / (1 + 0,5\ |b - b_n|)$

$Y = (Y_1 + Y_2) / 2$ $\Delta Y = Y_1 - Y_2$ $\Delta a'' = a''_1 - a''_2$ $\Delta b'' = b''_1 - b''_2$

$A_1 = 0,0170$ $A_2 = 0,0058$

$A_3 = 1,0$ $A_4 = 1,8$ $A_0 = 1,5$ background D65

$A_3 = 1,0$ $A_4 = 1,7$ $A_0 = 1,0$ background A

Just noticeable difference (JND) in four colour directions

ΔY = const $(A_1 + A_2 \cdot Y) / A_0$ in luminance direction *WN*

$\Delta a'' \cdot Y$ = const $(A_1 + A_2 \cdot Y) / (A_0 \cdot A_3)$ in chromaticity direction *RG*

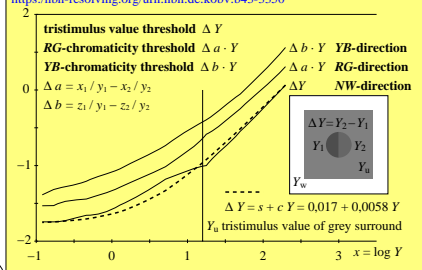$\Delta b'' \cdot Y$ = const $(A_1 + A_2 \cdot Y) / (A_0 \cdot A_4)$ in chromaticity direction *YB*

$\Delta c_{ab}'' \cdot Y$= const $(A_1 + A_2 \cdot Y) / (A_0 \cdot [A_3^2 + A_4^2]^{1/2})$ in any chromaticity direction c_{ab}

RF−6003RS1

Colour–difference formula LABJND 1985 only for achromatic colours

$$\Delta E^*_{JND} = \Delta E^*_{85} = A_0\,[\,(\Delta\,Y)^2 + (A_3\,\Delta\,a\cdot Y)^2 + (A_4\,\Delta\,b\cdot Y)^2\,]^{1/2} / (A_1 + A_2\cdot Y)$$

$a = x/y$ $b = -0,4\ z/y$

$Y = (Y_1 + Y_2) / 2$ $\Delta Y = Y_1 - Y_2$ $\Delta a = a_1 - a_2$ $\Delta b = b_1 - b_2$

$A_1 = 0,0170$ $A_2 = 0,0058$

$A_3 = 1,0$ $A_4 = 1,8$ $A_0 = 1,5$ background D65

$A_3 = 1,0$ $A_4 = 1,7$ $A_0 = 1,0$ background A

Just noticeable difference (JND) in three colour directions and line elements

$A_0 \cdot \Delta Y$ = $(A_1 + A_2 \cdot Y)$ in luminance direction *WN*

$A_0 \cdot \Delta a \cdot A_3 \cdot Y$ = $(A_1 + A_2 \cdot Y)$ in chromaticity direction *RG*

$A_0 \cdot \Delta b \cdot A_4 \cdot Y$ = $(A_1 + A_2 \cdot Y)$ in chromaticity direction *YB*

$dE^*_{85,L} = \frac{\delta}{\delta Y}L^*_{85} = \frac{\delta}{\delta Y}[(A_0 / A_2)\cdot ln\,(A_1 + A_2 \cdot Y)]$ = $A_0\cdot dY / (A_1 + A_2\cdot Y)$

$dE^*_{85,a} = \frac{\delta}{\delta a}a^*_{85} = \frac{\delta}{\delta a}[(A_0\cdot A_3 \cdot Y)\cdot a)/(A_1 + A_2\cdot Y)]$ = $A_0\cdot da\cdot A_3\cdot Y / (A_1 + A_2\cdot Y)$

$dE^*_{85,b} = \frac{\delta}{\delta b}b^*_{85} = \frac{\delta}{\delta b}[(A_0\cdot A_4 \cdot Y)\cdot b)/(A_1 + A_2\cdot Y)]$ = $A_0\cdot db\cdot A_4\cdot Y / (A_1 + A_2\cdot Y)$

RF−6003RU1

TUB-test chart BEA6; Criteria for elementary hues
Thresholds in NW, RG and YB direction; Colour–difference formula LABJND and metric with *(a, b)* & *Y*

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