Contrast step C_{Yi} (i=1 to 8), **CIE tristimulus values Y_W and Y_N according to ISO 9241−306[1)]**

Contrast step C_{Yi} and Y -ratio (i=1 .. 8)	CIE tristimulus value; ratio $Y_W : Y_N$ White W and Black N	CIE tristimulus value; range Y_{N1} ... Y_{N2}	Display (E) illuminance[2)]; ratio lux $E_{WE} : E_{NE}$	Display (P) luminance[2)]; ratio [cd/m²] $L_{WE} : L_{NE}$	application and colour mode at work place; illuminance on display 500 lux or 250/125/62 lux
C_{Y8} **288:1**	88,9 : 0,31	0,00 ... <0,46	445 : 1,55	142 : 0,50	display, only 062 lux
C_{Y7} **144:1**	88,9 : 0,62	0,46 ... <0,93	445 : 3,1	142 : 1,00	display, only 125 lux
C_{Y6} **72:1**	88,9 : 1,25	0,93 ... <1,87	445 : 6,2	142 : 2,00	display, only 250 lux
C_{Y5} **36:1**	**88,9 : 2,50**	**1,87 ... <3,75**	**445 : 12,4**	**142 : 4,00**	**display and surface**
C_{Y4} **18:1**	88,9 : 5,00	3,75 ... <7,50	445 : 24,8	142 : 8,00	display and surface
C_{Y3} **9:1**	88,9 : 10,0	7,50 ... <15,0	445 : 49,6	142 : 16,0	display and surface
C_{Y2} **4,5:1**	88,9 : 20,0	15,0 ... <30,0	445 : 99,2	142 : 32,0	display and surface
C_{Y1}**2,25:1[3)]**	88,9 : 40,0	30,0 ... <60,0	445 : 198	142 : 64,0	display and surface

1) The example shows data for emissive displays (E). The standard contrast step (bold) with L_{NE}= 4 cd/m² may be reached.
2) Measurement of 445 (≈ 500*0,889) lux corresponds to the viewing luminance L_V=142 cd/m² for an emmissive display (E).
3) For the contrast C_Y =36:1 the viewing luminances of both the black paper and the black on the screen are equal.
Also the viewing luminances of all colours at the screen and the paper are equal, for example for a 16 step grey scale.
A visual fatigue based on an adaptation changes between paper and display is unpossible.
For all black surfaces it is valid Y_N>=2.5. Therefore high contrast steps are only possible at the displays by reduced reflection.

Contrast step C_{Yi} (i=1 to 8), **CIE tristimulus values Y_W and Y_N according to ISO 9241−306[1)]**

Contrast step C_{Yi} and Y -ratio (i=1 .. 8)	CIE tristimulus value; ratio $Y_W : Y_N$ White W and Black N	CIE tristimulus value; range Y_{N1} ... Y_{N2}	Paper (S) luminance[2)]; ratio [cd/m²] $L_{WS} : L_{NS}$	Display (E) luminance[2)]; ratio [cd/m²] $L_{WE} : L_{NE}$	application and colour mode at work place; illuminance on display 500 lux or 250/125/62 lux
C_{Y8} **288:1**	88,9 : 0,31	0,00 ... <0,46	142 : 0,50	142 : 0,50	display, only 062 lux
C_{Y7} **144:1**	88,9 : 0,62	0,46 ... <0,93	142 : 1,00	142 : 1,00	display, only 125 lux
C_{Y6} **72:1**	88,9 : 1,25	0,93 ... <1,87	142 : 2,00	142 : 2,00	display, only 250 lux
C_{Y5} **36:1**	**88,9 : 2,50**	**1,87 ... <3,75**	**142 : 4,00**	**142 : 4,00**	**display and surface**
C_{Y4} **18:1**	88,9 : 5,00	3,75 ... <7,50	142 : 8,00	142 : 8,00	display and surface
C_{Y3} **9:1**	88,9 : 10,0	7,50 ... <15,0	142 : 16,0	142 : 16,0	display and surface
C_{Y2} **4,5:1**	88,9 : 20,0	15,0 ... <30,0	142 : 32,0	142 : 32,0	display and surface
C_{Y1}**2,25:1[3)]**	88,9 : 40,0	30,0 ... <60,0	142 : 64,0	142 : 64,0	display and surface

1) The example shows data for emissive displays (E). The standard contrast step (bold) with L_{NE}= 4 cd/m² may be reached.
2) 500 lux corresponds to the viewing luminance L_V=142 cd/m² for the standard offset paper (S) with the tristimulus value Y_W=88,9.
3) Measurement of 445 (≈ 500*0,889) lux corresponds to the viewing luminance L_V=142 cd/m² for an emmissive display (E).
4) For the contrast C_Y =36:1 the viewing luminances of both the black paper and the black on the screen are equal.
Also the viewing luminances of all colours at the screen and the paper are equal, for example for a 16 step grey scale.
For all black surfaces it is valid Y_N>=2.5. Therefore high contrast steps are only possible at the displays by reduced reflection.

Contrast step C_{Yi} (i=1 to 8), **CIE tristimulus values Y_W and Y_N according to ISO 9241−306[1)]**

Contrast step C_{Yi} and Y -ratio (i=1 .. 8)	CIE tristimulus value; ratio $Y_W : Y_N$ White W and Black N	CIE tristimulus value; range Y_{N1} ... Y_{N2}	Paper (S) luminance[2)]; ratio [cd/m²] $L_{WS} : L_{NS}$	Display (P) luminance[2)]; ratio [cd/m²] $L_{WP} : L_{NP}$	application and colour mode at work place; illuminance on display 500 lux or 250/125/62 lux
C_{Y8} **288:1**	88,9 : 0,31	0,00 ... <0,46	125*36 : 015	36*36 : 4,5	display, only 062 lux
C_{Y7} **144:1**	88,9 : 0,62	0,46 ... <0,93	125*36 : 031	36*36 : 09	display, only 125 lux
C_{Y6} **72:1**	88,9 : 1,25	0,93 ... <1,87	125*36 : 062	36*36 : 18	display, only 250 lux
C_{Y5} **36:1**	**88,9 : 2,50**	**1,87 ... <3,75**	**125*36 : 125**	**36*36 : 36**	**display and surface**
C_{Y4} **18:1**	88,9 : 5,00	3,75 ... <7,50	125*18 : 125	36*18 : 36	display and surface
C_{Y3} **9:1**	88,9 : 10,0	7,50 ... <15,0	125*09 : 125	36*09 : 36	display and surface
C_{Y2} **4,5:1**	88,9 : 20,0	15,0 ... <30,0	125*4,5 : 125	36*4,5 : 36	display and surface
C_{Y1}**2,25:1[3)]**	88,9 : 40,0	30,0 ... <60,0	125*2,25 : 125	36*2,25 : 36	display and surface

1) The example is intended for data projectors (P). The standard contrast step (bold) L_{WP}=36*36 cd/m² is hard to reach.
2) 500 lux corresponds to the viewing luminance L_V=36 cd/m² for the standard offset paper (S) with the tristimulus value Y_W=88,9.
3) For the contrast C_Y=2:1 the viewing luminances of both the black in the projection and the white standard offset paper are equal (!).
Visual fatigue caused by the adaptation luminance ratio 36:1 of the black at the screen and the black at the paper shall be reduced.
If for example a grey screen with the CIE tristimulus value Y_Z = 22,2 (=0,25*88.9) is used the contrast step C_{Y1} remains constant.
Then the luminance ratio of all colours at the screen and the paper has reduced to 9:1. This reduces visual fatigue.

Contrast step C_{Yi} (i=1 to 8), **CIE tristimulus values Y_W and Y_N according to ISO 9241−306[1)]**

Contrast step C_{Yi} and Y -ratio (i=1 .. 8)	CIE tristimulus value; ratio $Y_W : Y_N$ White W and Black N	CIE tristimulus value; range Y_{N1} ... Y_{N2}	Display (E) illuminance[2)]; ratio lux $E_{WE} : E_{NE}$	Display (P) luminance[2)]; ratio [cd/m²] $L_{WP} : L_{NP}$	application and colour mode at work place; illuminance on display 500 lux or 250/125/62 lux
C_{Y8} **288:1**	88,9 : 0,31	0,00 ... <0,46	125*36 : 015	36*36 : 4,5	display, only 062 lux
C_{Y7} **144:1**	88,9 : 0,62	0,46 ... <0,93	125*36 : 031	36*36 : 09	display, only 125 lux
C_{Y6} **72:1**	88,9 : 1,25	0,93 ... <1,87	125*36 : 062	36*36 : 18	display, only 250 lux
C_{Y5} **36:1**	**88,9 : 2,50**	**1,87 ... <3,75**	**125*36 : 125**	**36*36 : 36**	**display and surface**
C_{Y4} **18:1**	88,9 : 5,00	3,75 ... <7,50	125*18 : 125	36*18 : 36	display and surface
C_{Y3} **9:1**	88,9 : 10,0	7,50 ... <15,0	125*09 : 125	36*09 : 36	display and surface
C_{Y2} **4,5:1**	88,9 : 20,0	15,0 ... <30,0	125*4,5 : 125	36*4,5 : 36	display and surface
C_{Y1}**2,25:1[3)]**	88,9 : 40,0	30,0 ... <60,0	125*2,25 : 125	36*2,25 : 36	display and surface

1) The example is intended for data projectors (P). The standard contrast step (bold) L_{WP}=142*36 cd/m² is hard to reach.
2) 500 lux corresponds to the viewing luminance L_V=142 cd/m² for the standard offset paper (S) with the tristimulus value Y_W=88,9.
3) For the contrast C_Y=2:1 the viewing luminances of both the black in the projection and the white standard offset paper are equal (!).
Visual fatigue caused by the adaptation luminance ratio 36:1 of the black at the screen and the black at the paper shall be reduced.
If for example a grey screen with the CIE tristimulus value Y_Z = 22,2 (=0,25*88.9) is used the contrast step C_{Y1} remains constant.
Then the luminance ratio of all colours at the screen and the paper has reduced to 9:1. This reduces visual fatigue.

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