

Contrast step C_{Yi} (i=1 to 8), CIE tristimulus value Y_N , grey steps according to ISO 9241-306¹⁾

Contrast step C_{Yi} and Y-ratio (i=1 .. 8)	CIE tristimulus value Y_N and CIE lightness L_N^* of black	total viewing display illuminance E_{P+R} [lux] ²⁾	measured projector (P) display illuminance E_P [lux] ²⁾	room light (R) display illuminance E_R [lux] ²⁾	grey steps without output linearisation delta $L^*=1$ amount a_n ²⁾	grey steps with output linearisation delta $L^*=1$ amount a_l ²⁾
C_{Y8} 288:1	0,31 / 1	19200+16000	35075	125	47 (max)	94 (max)
C_{Y7} 144:1	0,62 / 6	9600+8000	17475	125	44	88
C_{Y6} 72:1	1,25 / 11	4800+4000	8675	125	42	84
C_{Y5} 36:1	2,5 / 18	2400+2000	4275	125	38	77
C_{Y4} 18:1	5,0 / 27	1200+1000	2075	125	34	68
C_{Y3} 9:1	10 / 38	600+500	975	125	28	57
C_{Y2} 4,5:1	20 / 52	300+250	425	125	21	43
C_{Y1} 2,25:1	40 / 70	150+125	150	125	12	25

- 1) The example is intended for data projectors (P). The standard contrast step (bold) $C_{Y5} = 36:1$ is hard to reach.
- 2) For the amount of discriminable colour steps use the equations: $c_n = a_n^3$ or $c_l = a_l^3$, for example $c_n = 4096$ for $a_n = 16$.
- 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 $Y_Z = 22,2$ ($=0,25 \cdot 88,9$) 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.