

**Contrast steps  $C_{Y_i}$  ( $i=1$  to 8), CIE tristimulus values  $Y_W$  and  $Y_N$  according to ISO 9241-306<sup>1)</sup>**

Contrast step $C_{Y_i}$ and $Y$ -ratio ( $i=1 \dots 8$ )	CIE tristimulus values; Ratio $Y_W : Y_N$ of White $W$ and Black $N$	CIE tristimulus values; Range $Y_{N1} \dots Y_{N2}$	Paper (S) luminance <sup>2)</sup> ; Ratio $[cd/m^2]$ $L_{WS} : L_{NS}$	Display (P) luminance <sup>2)</sup> ; Ratio $[cd/m^2]$ $L_{WP} : L_{NP}$	application and colour mode at work place; illuminance on display 125 lux or 62/31/15 lux
$C_{Y8}$ <b>288:1</b>	88,9 : 0,31	0,00 ... <0,46	142 : 142/288	36*36 : 4,5	display, only 15 lux
$C_{Y7}$ <b>144:1</b>	88,9 : 0,62	0,46 ... <0,93	142 : 142/144	36*36 : 09	display, only 31 lux
$C_{Y6}$ <b>72:1</b>	88,9 : 1,25	0,93 ... <1,87	142 : 142/72	36*36 : 18	display, only 62 lux
$C_{Y5}$ <b>36:1</b>	<b>88,9 : 2,50</b>	<b>1,87 ... &lt;3,75</b>	<b>142 : 142/36</b>	<b>36*36 : 36</b>	<b>display &amp; surface</b>
$C_{Y4}$ <b>18:1</b>	88,9 : 5,00	3,75 ... <7,50	142 : 142/18	36*18 : 36	<b>display &amp; surface</b>
$C_{Y3}$ <b>9:1</b>	88,9 : 10,0	7,50 ... <15,0	142 : 142/09	36*09 : 36	<b>display &amp; surface</b>
$C_{Y2}$ <b>4,5:1</b>	88,9 : 20,0	15,0 ... <30,0	142 : 142/4,5	36*4,5 : 36	<b>display &amp; surface</b>
$C_{Y1}$ <b>2,25:1<sup>3)</sup></b>	88,9 : 40,0	30,0 ... <60,0	142 : 142/2,25	36*2,25 : 36	<b>display &amp; surface</b>

- 1) The example is intended for data projectors (P). The standard contrast step (bold) with  $L_{WP}=36*36 \text{ cd/m}^2$  is hard to reach.
- 2) 125 lux corresponds to the viewing luminance  $L_v=36 \text{ cd/m}^2$  for a standard white paper 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  $C_{Y_i}$  remains constant.

Then the luminance ratio of all colours at the screen and the paper has reduced to 9:1. This reduces visual fatigue.