

| Contrast step $C_{Yi}$ ( $i=1$ to 8), CIE tristimulus values $Y_W$ and $Y_N$ according to ISO 9241-306 <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           |                                                          |                                                                                              |                                                                                                |                                                                                                         |
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| Contrast step<br>$C_{Yi}$ and $Y$ -ratio<br>( $i=1 \dots 8$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CIE tristimulus value;<br>ratio<br>$Y_W : Y_N$<br>White $W$ and Black $N$ | CIE tristimulus value;<br>range<br>$Y_{N1} \dots Y_{N2}$ | Paper (S)<br>luminance <sup>2)</sup> ;<br>ratio<br>[cd/m <sup>2</sup> ]<br>$L_{WS} : L_{NS}$ | Display (E)<br>luminance <sup>2)</sup> ;<br>ratio<br>[cd/m <sup>2</sup> ]<br>$L_{WE} : L_{NE}$ | application and colour mode<br>at work place;<br>illuminance<br>on display 500 lux<br>or 250/125/62 lux |
| $C_{Y8}$ <b>288:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 88,9 : 0,31                                                               | 0,00 ... <0,46                                           | 142 : 142/288                                                                                | 142*36 : 018                                                                                   | display, only 062 lux                                                                                   |
| $C_{Y7}$ <b>144:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 88,9 : 0,62                                                               | 0,46 ... <0,93                                           | 142 : 142/144                                                                                | 142*36 : 035                                                                                   | display, only 125 lux                                                                                   |
| $C_{Y6}$ <b>72:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 88,9 : 1,25                                                               | 0,93 ... <1,87                                           | 142 : 142/72                                                                                 | 142*36 : 071                                                                                   | display, only 250 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>142*36 : 142</b>                                                                            | <b>display and surface</b>                                                                              |
| $C_{Y4}$ <b>18:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 88,9 : 5,00                                                               | 3,75 ... <7,50                                           | 142 : 142/18                                                                                 | 142*18 : 142                                                                                   | display and surface                                                                                     |
| $C_{Y3}$ <b>9:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 88,9 : 10,0                                                               | 7,50 ... <15,0                                           | 142 : 142/09                                                                                 | 142*09 : 142                                                                                   | display and surface                                                                                     |
| $C_{Y2}$ <b>4,5:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 88,9 : 20,0                                                               | 15,0 ... <30,0                                           | 142 : 142/4,5                                                                                | 142*4,5 : 142                                                                                  | display and surface                                                                                     |
| $C_{Y1}$ <b>2,25:1<sup>3)</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 88,9 : 40,0                                                               | 30,0 ... <60,0                                           | 142 : 142/2,25                                                                               | 142*2,25 : 142                                                                                 | display and surface                                                                                     |
| <p><b>1) The example is intended for data projectors (P). The standard contrast step (bold) <math>L_{WP}=142*36</math> cd/m<sup>2</sup> is hard to reach.</b></p> <p>2) 500 lux corresponds to the viewing luminance <math>L_V=142</math> cd/m<sup>2</sup> for the standard offset paper (S) with the tristimulus value <math>Y_W=88,9</math>.</p> <p>3) For the contrast <math>C_Y=2:1</math> the viewing luminances of both the black in the projection and the white standard offset paper are equal (!).<br/> 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.<br/> If for example a grey screen with the CIE tristimulus value <math>Y_Z = 22,2</math> (<math>=0,25*88,9</math>) is used the contrast step <math>C_{Yi}</math> remains constant.<br/> Then the luminance ratio of all colours at the screen and the paper has reduced to 9:1. This reduces visual fatigue.</p> |                                                                           |                                                          |                                                                                              |                                                                                                |                                                                                                         |