

# Equal 16 step grey scaling between $L^*_N$ and $L^*_W$ for three reflections of ambient light

| $L^*$ | No ambient reflection $Y_N=0, L^*_N=0$<br>lightness difference $\Delta L^*=6,3$ |       |         |            |            |                   | Ambient reflection $Y_N=2,5, L^*_N=18$<br>lightness difference $\Delta L^*=5,1$ |       |         |            |            |                   | Ambient reflection $Y_N=40, L^*_N=70$<br>lightness difference $\Delta L^*=1,7$ |       |         |            |            |                   |
|-------|---------------------------------------------------------------------------------|-------|---------|------------|------------|-------------------|---------------------------------------------------------------------------------|-------|---------|------------|------------|-------------------|--------------------------------------------------------------------------------|-------|---------|------------|------------|-------------------|
|       | n0.                                                                             | $w^*$ | $w^*_r$ | $L^*_{it}$ | $L^*_{re}$ | $\Delta L^*_{re}$ | n0.                                                                             | $w^*$ | $w^*_r$ | $L^*_{it}$ | $L^*_{re}$ | $\Delta L^*_{re}$ | n0.                                                                            | $w^*$ | $w^*_r$ | $L^*_{it}$ | $L^*_{re}$ | $\Delta L^*_{re}$ |
|       |                                                                                 |       |         |            |            |                   |                                                                                 |       |         |            |            |                   |                                                                                |       |         |            |            |                   |
| 100   | ○ 16                                                                            | 1.0   | 1.0     | 95.4       | 95.4       |                   | ○ 16                                                                            | 1.0   | 1.0     | 95.4       | 95.4       |                   | ○ 16                                                                           | 1.0   | 1.0     | 95.4       | 95.4       |                   |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 6.16              |                                                                                |       |         |            |            | 3.37              |
|       | ● 15                                                                            | 0.933 | 0.933   | 89.0       | 89.0       |                   | ● 15                                                                            | 0.945 | 0.933   | 90.2       | 89.2       |                   | ● 15                                                                           | 0.964 | 0.866   | 91.9       | 88.8       | 3.17              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 6.14              |                                                                                |       |         |            |            | 3.17              |
|       | ● 14                                                                            | 0.866 | 0.866   | 82.6       | 82.6       |                   | ● 14                                                                            | 0.891 | 0.866   | 85.0       | 83.0       |                   | ● 14                                                                           | 0.946 | 0.8     | 90.2       | 85.9       | 4.25              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 6.11              |                                                                                |       |         |            |            | 4.25              |
|       | ● 13                                                                            | 0.8   | 0.8     | 76.3       | 76.3       |                   | ● 13                                                                            | 0.837 | 0.799   | 79.9       | 76.9       |                   | ● 13                                                                           | 0.928 | 0.733   | 88.5       | 83.1       | 5.47              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 6.06              |                                                                                |       |         |            |            | 5.47              |
|       | ● 12                                                                            | 0.733 | 0.733   | 69.9       | 69.9       |                   | ● 12                                                                            | 0.783 | 0.733   | 74.7       | 70.9       |                   | ● 12                                                                           | 0.91  | 0.666   | 86.8       | 80.7       | 6.21              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 6.01              |                                                                                |       |         |            |            | 6.21              |
|       | ● 11                                                                            | 0.666 | 0.666   | 63.6       | 63.6       |                   | ● 11                                                                            | 0.729 | 0.666   | 69.6       | 64.9       |                   | ● 11                                                                           | 0.892 | 0.6     | 85.1       | 78.4       | 6.74              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 5.94              |                                                                                |       |         |            |            | 6.74              |
|       | ● 10                                                                            | 0.6   | 0.6     | 57.2       | 57.2       |                   | ● 10                                                                            | 0.675 | 0.599   | 64.4       | 58.9       |                   | ● 10                                                                           | 0.874 | 0.533   | 83.4       | 76.5       | 6.89              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 5.84              |                                                                                |       |         |            |            | 6.89              |
|       | ● 9                                                                             | 0.533 | 0.533   | 50.8       | 50.8       |                   | ● 9                                                                             | 0.621 | 0.533   | 59.2       | 53.1       |                   | ● 9                                                                            | 0.856 | 0.466   | 81.6       | 74.8       | 6.74              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 5.71              |                                                                                |       |         |            |            | 6.74              |
|       | ● 8                                                                             | 0.466 | 0.466   | 44.5       | 44.5       |                   | ● 8                                                                             | 0.567 | 0.466   | 54.1       | 47.3       |                   | ● 8                                                                            | 0.838 | 0.399   | 79.9       | 73.4       | 6.54              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 5.53              |                                                                                |       |         |            |            | 6.54              |
|       | ● 7                                                                             | 0.4   | 0.4     | 38.1       | 38.1       |                   | ● 7                                                                             | 0.513 | 0.4     | 48.9       | 41.8       |                   | ● 7                                                                            | 0.82  | 0.333   | 78.2       | 72.3       | 5.94              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 5.26              |                                                                                |       |         |            |            | 5.94              |
|       | ● 6                                                                             | 0.333 | 0.333   | 31.8       | 31.8       |                   | ● 6                                                                             | 0.459 | 0.333   | 43.8       | 36.5       |                   | ● 6                                                                            | 0.802 | 0.266   | 76.5       | 71.4       | 5.14              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 4.89              |                                                                                |       |         |            |            | 5.14              |
|       | ● 5                                                                             | 0.266 | 0.266   | 25.4       | 25.4       |                   | ● 5                                                                             | 0.405 | 0.266   | 38.6       | 31.6       |                   | ● 5                                                                            | 0.784 | 0.199   | 74.8       | 70.7       | 4.14              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 4.37              |                                                                                |       |         |            |            | 4.14              |
|       | ● 4                                                                             | 0.2   | 0.2     | 19.0       | 19.0       |                   | ● 4                                                                             | 0.351 | 0.199   | 33.4       | 27.3       |                   | ● 4                                                                            | 0.766 | 0.133   | 73.1       | 70.2       | 2.94              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 3.66              |                                                                                |       |         |            |            | 3.66              |
|       | ● 3                                                                             | 0.133 | 0.133   | 12.7       | 12.7       |                   | ● 3                                                                             | 0.296 | 0.133   | 28.3       | 23.6       |                   | ● 3                                                                            | 0.748 | 0.066   | 71.4       | 69.9       | 1.54              |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 2.81              |                                                                                |       |         |            |            | 2.81              |
|       | ● 2                                                                             | 0.066 | 0.066   | 6.3        | 6.3        |                   | ● 2                                                                             | 0.242 | 0.066   | 23.1       | 20.8       |                   | ● 2                                                                            | 0.73  | 0.0     | 69.6       | 69.6       | 0.0               |
|       |                                                                                 |       |         |            |            | 6.35              |                                                                                 |       |         |            |            | 2.83              |                                                                                |       |         |            |            | 0.0               |
|       | ● 1                                                                             | 0.0   | 0.0     | 0.0        | 0.0        |                   | ● 1                                                                             | 0.188 | 0.0     | 18.0       | 18.0       |                   |                                                                                |       |         |            |            |                   |

ISO/CIE 11664-4:  $L^*_{it}$  = intended CIELAB lightness of output

IEC 61966-2-1:  $w^*_{sRGB}$  is approximately proportional to  $L^*$

$w^*_{sRGB} = L^*/95,4$ ;  $w^*_r = [L^*-L^*_N] / [L^*_W-L^*_N]$

$L^*_{re}$  = real lightness of output without output linearization