

### Colorimetric data for system lines TLS00 -> ORS18, TLS00, NRS18, SRS18

For input  $LCH^*_{a0}$  (TLS00 ) and output  $olv^*_{3m}$  for 4 systems (  $m = 0$  to 4 )  
Six CIELAB hue angles of device ORS18: (37.7 96.4 150.9 236.0 305.0 353.7);  
Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);  
Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);  
Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

| no. Colour | ->TLS00<br>$LCH^*_{a0}$ | ->TLS00<br>$n^*, c^*, H^*_{ai0}$ | ORS18<br>$olv^*_{31}$ | TLS00<br>$olv^*_{32}$ | NRS18<br>$olv^*_{33}$ | SRS18<br>$olv^*_{34}$ |
|------------|-------------------------|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 01 O=000y  | 44.3 55.5 40            | 0.3 0.5 40                       | 0.7 0.22 0.2          | 0.7 0.2 0.2           | 0.7 0.31 0.2          | 0.7 0.28 0.2          |
| 02 o10y    | 46.3 47.4 46            | 0.3 0.5 46                       | 0.7 0.27 0.2          | 0.7 0.25 0.2          | 0.7 0.35 0.2          | 0.7 0.33 0.2          |
| 03 o20y    | 48.7 45.2 53            | 0.3 0.5 53                       | 0.7 0.33 0.2          | 0.7 0.3 0.2           | 0.7 0.41 0.2          | 0.7 0.39 0.2          |
| 04 o30y    | 50.7 43.9 59            | 0.3 0.5 59                       | 0.7 0.38 0.2          | 0.7 0.35 0.2          | 0.7 0.45 0.2          | 0.7 0.44 0.2          |
| 05 o40y    | 52.7 43.1 65            | 0.3 0.5 65                       | 0.7 0.43 0.2          | 0.7 0.4 0.2           | 0.7 0.5 0.2           | 0.7 0.49 0.2          |
| 06 o50y    | 54.7 42.8 71            | 0.3 0.5 71                       | 0.7 0.48 0.2          | 0.7 0.45 0.2          | 0.7 0.54 0.2          | 0.7 0.54 0.2          |
| 07 o60y    | 57.1 43.1 78            | 0.3 0.5 78                       | 0.7 0.54 0.2          | 0.7 0.5 0.2           | 0.7 0.59 0.2          | 0.7 0.6 0.2           |
| 08 o70y    | 59.1 43.9 84            | 0.3 0.5 84                       | 0.7 0.59 0.2          | 0.7 0.55 0.2          | 0.7 0.64 0.2          | 0.7 0.65 0.2          |
| 09 o80y    | 61.1 45.2 90            | 0.3 0.5 90                       | 0.7 0.65 0.2          | 0.7 0.6 0.2           | 0.7 0.68 0.2          | 0.7 0.7 0.2           |
| 10 o90y    | 63.5 47.5 97            | 0.3 0.5 97                       | 0.69 0.7 0.2          | 0.7 0.65 0.2          | 0.67 0.7 0.2          | 0.64 0.7 0.2          |
| 11 Y=y00l  | 65.4 46.5 103           | 0.3 0.5 103                      | 0.64 0.7 0.2          | 0.7 0.7 0.2           | 0.62 0.7 0.2          | 0.59 0.7 0.2          |

**Goal:** Transfer coordinates  $LCH^*_{a0}$  (system m=0) to  $rgb_m = olv^*_{3m}$  (system m=1 to 4)

The given data  $LCH^*_{a0}$  include the device hue  $H^*_{a0}$

Integer (i) device hue:  $H^*_{ai0} = \text{round} ( H^*_{a0} )$  (1)

Fetch device data  $LCH^*_{a,Mm}$  from table with 361 entries for  $H^*_{ai0}$  from 0 to 360 degrees  
Lightness, chroma, hue:  $LCH^*_{a,M0} = LCH^*_{a,M0} [ H^*_{ai0} ]$  (2)

Calculate  $lcw^*$  data from  $LC^*_{a0}$  and  $LC^*_{a,M0}$ :

Relative lightness:  $l^* = [ L^*_{0} - L^*_{N0} ] / [ L^*_{W0} - L^*_{N0} ]$  (3)

Relative chroma:  $c^* = C^*_{a0} / C^*_{a,M0}$  (4)

Relative Blackness:  $n^* = 1 - l^* + c^* [ L^*_{M0} - L^*_{N0} ] / [ L^*_{W0} - L^*_{N0} ]$  (5)

Fetch device data  $olv^*_{3,Mm}$  from table with 361 entries for  $H^*_{ai0}$  from 0 to 360 degrees  
"red, green, blue"  $rgb_{Mm}$  data:  $olv^*_{3,Mm} = olv^*_{3,Mm} [ H^*_{ai0} ]$  (6)

For any input or output device (m=0 to 4) it is valid for constant  $n^*, c^*, l^*, H^*_a$ :  
"red, green, blue"  $rgb_m$  data:  $olv^*_{3m} = 1 - n^* - c^* + c^* olv^*_{3,Mm}$  (7)

**Result:** device dependent relative CIELAB data of 4 systems m=1 to 4:  
"red, green, blue"  $rgb_m$  data:  $rgb_m = olv^*_{3m}$  (8)

### Colorimetric data for system lines TLS00 -> ORS18, TLS00, NRS18, SRS18

For input  $olv^*_{30}$  (TLS00 ) and output  $olv^*_{3m}$  for 4 systems (  $m = 0$  to 4 )  
Six CIELAB hue angles of device ORS18: (37.7 96.4 150.9 236.0 305.0 353.7);  
Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);  
Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);  
Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

| no. Colour | ->TLS00<br>$olv^*_{30}$ | ->TLS00<br>$n^*, c^*, H^*_{si0}$ | ORS18<br>$olv^*_{31}$ | TLS00<br>$olv^*_{32}$ | NRS18<br>$olv^*_{33}$ | SRS18<br>$olv^*_{34}$ |
|------------|-------------------------|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 01 O=000y  | 0.7 0.2 0.2 0.3 0.5 30  | 0.7 0.22 0.2                     | 0.7 0.2 0.2           | 0.7 0.2 0.2           | 0.7 0.31 0.2          | 0.7 0.28 0.2          |
| 02 o10y    | 0.7 0.25 0.2 0.3 0.5 35 | 0.7 0.27 0.2                     | 0.7 0.25 0.2          | 0.7 0.25 0.2          | 0.7 0.35 0.2          | 0.7 0.33 0.2          |
| 03 o20y    | 0.7 0.3 0.2 0.3 0.5 41  | 0.7 0.33 0.2                     | 0.7 0.3 0.2           | 0.7 0.3 0.2           | 0.7 0.41 0.2          | 0.7 0.39 0.2          |
| 04 o30y    | 0.7 0.35 0.2 0.3 0.5 47 | 0.7 0.38 0.2                     | 0.7 0.35 0.2          | 0.7 0.35 0.2          | 0.7 0.45 0.2          | 0.7 0.44 0.2          |
| 05 o40y    | 0.7 0.4 0.2 0.3 0.5 53  | 0.7 0.43 0.2                     | 0.7 0.4 0.2           | 0.7 0.4 0.2           | 0.7 0.5 0.2           | 0.7 0.49 0.2          |
| 06 o50y    | 0.7 0.45 0.2 0.3 0.5 60 | 0.7 0.48 0.2                     | 0.7 0.45 0.2          | 0.7 0.45 0.2          | 0.7 0.54 0.2          | 0.7 0.54 0.2          |
| 07 o60y    | 0.7 0.5 0.2 0.3 0.5 67  | 0.7 0.54 0.2                     | 0.7 0.5 0.2           | 0.7 0.5 0.2           | 0.7 0.59 0.2          | 0.7 0.6 0.2           |
| 08 o70y    | 0.7 0.55 0.2 0.3 0.5 73 | 0.7 0.59 0.2                     | 0.7 0.55 0.2          | 0.7 0.55 0.2          | 0.7 0.64 0.2          | 0.7 0.65 0.2          |
| 09 o80y    | 0.7 0.6 0.2 0.3 0.5 79  | 0.7 0.65 0.2                     | 0.7 0.6 0.2           | 0.7 0.6 0.2           | 0.7 0.68 0.2          | 0.7 0.7 0.2           |
| 10 o90y    | 0.7 0.65 0.2 0.3 0.5 85 | 0.69 0.7 0.2                     | 0.7 0.65 0.2          | 0.67 0.7 0.2          | 0.64 0.7 0.2          | 0.64 0.7 0.2          |
| 11 Y=y00l  | 0.7 0.7 0.2 0.3 0.5 90  | 0.64 0.7 0.2                     | 0.7 0.7 0.2           | 0.62 0.7 0.2          | 0.59 0.7 0.2          | 0.59 0.7 0.2          |

**Goal:** Transfer coordinates  $olv^*_{30}$  (system m=0) to  $olv^*_{3m}$  (system m=1 to 4)

The following equations for relative blackness and chroma are valid for any device:

$$n^* = 1 - \max ( o^*_{30}, l^*_{30}, v^*_{30} ) \quad (1)$$

$$c^* = \max ( o^*_{30}, l^*_{30}, v^*_{30} ) - \min ( o^*_{30}, l^*_{30}, v^*_{30} ) \quad (2)$$

For the calculation of the missing relative device hue assume

as a starting point that the three values  $olv^*_{30}$  belong to the standard (s) device SRS18:

relative red-green chroma:  $a^*_{r0} = o^*_{30} \cos(30) + l^*_{30} \cos(150)$  (3)

relative yellow-blue chroma:  $b^*_{r0} = o^*_{30} \sin(30) + l^*_{30} \sin(150) - v^*_{30} \sin(270)$  (4)

Standard integer hue:  $H^*_{si0} = \text{round} [ \text{atan} ( b^*_{r0} / a^*_{r0} ) ]$  (5)

Fetch device integer hue:  $H^*_{ai0} = H^*_{si\_ai} [ H^*_{si0} ]$  (6)

Fetch device data  $olv^*_{3,Mm}$  from table with 361 entries for  $H^*_{ai0}$  from 0 to 360 degrees

"red, green, blue"  $rgb_m$  data:  $olv^*_{3,Mm} = olv^*_{3,Mm} [ H^*_{ai0} ]$  (7)

For any input or output device (m=0 to 4) it is valid for constant  $n^*, c^*, l^*, H^*_a$ :  
"red, green, blue"  $rgb_m$  data:  $olv^*_{3m} = 1 - n^* - c^* + c^* olv^*_{3,Mm}$  (8)

**Result:** device dependent relative CIELAB data of 4 systems m=1 to 4:  
"red, green, blue"  $rgb_m$  data:  $rgb_m = olv^*_{3m}$  (9)