

Colorimetric data for system line NRS18 -> SRS18

For input LCH^*_{a0} of the system 0: NRS18

Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);

and output $LCH^*_{a,M1}$, $olv^*_{3,M1}$, LCH^*_{a1} , olv^*_{31} of the system 1: SRS18

Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

no. Colour	->NRS18 LCH^*_{a0}	->NRS18 n^* , c^* , H^*_{ai0}	SRS18 $LCH^*_{a,M1}$	SRS18 $olv^*_{3,M1}$	SRS18 LCH^*_{a1}	SRS18 olv^*_{31}	0 1
01 R=r00j	52.8 38.5 25	0.3 0.5 25	56.7 74.0 25	1.0 0.0 0.08	52.8 37.0 25	0.7 0.2 0.24	
02 r10j	52.8 36.2 32	0.3 0.5 32	56.7 75.9 32	1.0 0.03 0.0	52.8 38.0 32	0.7 0.22 0.2	
03 r20j	52.8 34.4 39	0.3 0.5 39	56.7 71.8 39	1.0 0.15 0.0	52.8 35.9 39	0.7 0.27 0.2	
04 r30j	52.8 33.1 46	0.3 0.5 46	56.7 69.1 46	1.0 0.27 0.0	52.8 34.5 46	0.7 0.33 0.2	
05 r40j	52.8 32.5 52	0.3 0.5 52	56.7 67.7 52	1.0 0.37 0.0	52.8 33.8 52	0.7 0.38 0.2	
06 r50j	52.8 32.3 59	0.3 0.5 59	56.7 67.0 59	1.0 0.48 0.0	52.8 33.5 59	0.7 0.44 0.2	
07 r60j	52.8 32.6 66	0.3 0.5 66	56.7 67.4 66	1.0 0.6 0.0	52.8 33.7 66	0.7 0.5 0.2	
08 r070j	52.8 33.2 72	0.3 0.5 72	56.7 68.5 72	1.0 0.7 0.0	52.8 34.3 72	0.7 0.55 0.2	
09 r80j	52.8 34.4 79	0.3 0.5 79	56.7 70.9 79	1.0 0.82 0.0	52.8 35.4 79	0.7 0.61 0.2	
10 r90j	52.8 36.3 86	0.3 0.5 86	56.7 74.6 86	1.0 0.93 0.0	52.8 37.3 86	0.7 0.67 0.2	
11 J=j00g	52.8 38.6 92	0.3 0.5 92	56.7 75.9 92	0.97 1.0 0.0	52.8 38.0 92	0.68 0.7 0.2	

Goal: Transfer coordinates LCH^*_{a0} (system m=0) to LCH^*_{a1} and olv^*_{31} (system m=1)

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 $LCH^*_{a,M0}$ 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: $l^* = [L^*_{a0} - L^*_{N0}] / [L^*_{w0} - L^*_{N0}]$ (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 $LCH^*_{a,M1}$ and $olv^*_{3,M1}$ from table with 361 entries for H^*_{ai0}
lightness, chroma, hue: $LCH^*_{a,M1} = LCH^*_{a,M1} [H^*_{ai0}]$ (6)

"Red, Green, Blue" rgb_1 data: $olv^*_{3,M1} = olv^*_{3,M1} [H^*_{ai0}]$ (7)

For any input or output device (m=0 to 1) it is valid for constant n^* , c^* , l^* , H^*_{a} :

CIELAB lightness: $L^*_1 = L^*_{a1} = L^*_{N1} + l^* [L^*_{w1} - L^*_{N1}]$ (8)

Adated CIELAB chroma: $C^*_{a1} = c^* C^*_{a,M1}$ (9)

Adated CIELAB hue: $H^*_{a1} = H^*_{a0}$ (10)

"red, green, blue" rgb_1 data: $olv^*_{31} = 1 - n^* - c^* + c^* olv^*_{3,M1}$ (11)

Result: device dependent adapted and relative CIELAB data of system m=1:

lightness, chroma, hue: LCH^*_{a1} and rgb_1 data: olv^*_{31} (12)

Colorimetric data for system line NRS18 -> SRS18

For input olv^*_{30} of the system 0: NRS18

Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);

and output $LCH^*_{a,M1}$, $olv^*_{3,M1}$, LCH^*_{a1} , olv^*_{31} of the system 1: SRS18

Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

no. Colour	->NRS18 $olv^*_{30}=rgb^*_{30}n^*$, c^* , H^*_{si0}	->NRS18 $LCH^*_{a,M1}$	SRS18 $olv^*_{3,M1}$	SRS18 LCH^*_{a1}	SRS18 olv^*_{31}	0 1
01 R=r00j	0.7 0.2 0.2 0.3 0.5 30	56.7 74.0 25	1.0 0.0 0.08	52.8 37.0 25	0.7 0.2 0.24	
02 r10j	0.7 0.25 0.2 0.3 0.5 35	56.7 75.9 32	1.0 0.03 0.0	52.8 38.0 32	0.7 0.22 0.2	
03 r20j	0.7 0.3 0.2 0.3 0.5 41	56.7 71.8 39	1.0 0.15 0.0	52.8 35.9 39	0.7 0.27 0.2	
04 r30j	0.7 0.35 0.2 0.3 0.5 47	56.7 69.1 46	1.0 0.27 0.0	52.8 34.5 46	0.7 0.33 0.2	
05 r40j	0.7 0.4 0.2 0.3 0.5 53	56.7 67.7 52	1.0 0.37 0.0	52.8 33.8 52	0.7 0.38 0.2	
06 r50j	0.7 0.45 0.2 0.3 0.5 60	56.7 67.0 59	1.0 0.48 0.0	52.8 33.5 59	0.7 0.44 0.2	
07 r60j	0.7 0.5 0.2 0.3 0.5 67	56.7 67.4 66	1.0 0.6 0.0	52.8 33.7 66	0.7 0.5 0.2	
08 r070j	0.7 0.55 0.2 0.3 0.5 73	56.7 68.5 72	1.0 0.7 0.0	52.8 34.3 72	0.7 0.55 0.2	
09 r80j	0.7 0.6 0.2 0.3 0.5 79	56.7 70.9 79	1.0 0.82 0.0	52.8 35.4 79	0.7 0.61 0.2	
10 r90j	0.7 0.65 0.2 0.3 0.5 85	56.7 74.6 86	1.0 0.93 0.0	52.8 37.3 86	0.7 0.67 0.2	
11 J=j00g	0.7 0.7 0.2 0.3 0.5 90	56.7 75.9 92	0.97 1.0 0.0	52.8 38.0 92	0.68 0.7 0.2	

Goal: Transfer coordinates olv^*_{30} (system m=0) to LCH^*_{a1} and olv^*_{31} (system m=1)

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

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

$c^* = \max (o^*_{30}, l^*_{30}, v^*_{30}) - \min (o^*_{30}, l^*_{30}, v^*_{30})$ (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 $LCH^*_{a,M0}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

Lightness, chroma, hue: $LCH^*_{a,M0} = LCH^*_{a,M0} [H^*_{ai0}]$ (7)

Fetch device data $LCH^*_{a,M1}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

lightness, chroma, hue: $LCH^*_{a,M1} = LCH^*_{a,M1} [H^*_{ai0}]$ (8)

For any input or output device (m=0 to 1) it is valid for constant n^* , c^* , l^* , H^*_{a} :

CIELAB lightness: $L^*_1 = L^*_{a1} = L^*_{N1} + l^* [L^*_{w1} - L^*_{N1}]$ (9)

Adated CIELAB chroma: $C^*_{a1} = c^* C^*_{a,M1}$ (10)

Adated CIELAB hue: $H^*_{a1} = H^*_{a,M0} = H^*_{a,M1}$ (11)

"red, green, blue" rgb_1 data: $olv^*_{31} = 1 - n^* - c^* + c^* olv^*_{3,M1}$ (12)

Result: device dependent adapted and relative CIELAB data of system m=1:

lightness, chroma, hue: LCH^*_{a1} and rgb_1 data: olv^*_{31} (13)