

**Colourimetric scaling of achromatic colours between peak white and black.**  
**Relations between tristimulus value Y, luminance L, and lightness L\* of ISO-standards**

Colour (light or paper)	tristimulus values	IEC sRGB <sub>W</sub> lightness	relative luminance	CIE LAB <sub>W</sub> lightness	TUBLOG <sub>U</sub> lightness
Contrast W:N (25:1=100:4)	$Y^{(50.5-2,24)}$ =s <sub>W</sub> L <sub>rw</sub> <sup>1/2,4</sup>	$L_{rw}^{IEC sRGB_{W1/2,4}}$ =s <sub>W</sub> L <sub>rw</sub> <sup>1/2,4</sup>	$L_{rw}/L_{rw}$ =L/L <sub>W</sub>	$L_{rw}^{IEC LAB_{W1/2,4}}$ =c <sub>W</sub> L <sub>rw</sub> <sup>1/3-16</sup>	$L_{rw}^{TUBLOG_{U1/2,4}}$ =t <sub>U</sub> log(L <sub>rw</sub> )+50
White P2 (light)	500 =20*25	100 =s(5,00) <sup>1/2,4</sup>	5 =1,00	100 =c(5,00) <sup>1/3-16</sup>	100-50+52 =t <sub>U</sub> log(25,00)+50
White W (fluorescent paper)	100 =20*5	100-50+50 =s(1,00) <sup>1/2,4</sup>	5 =1,00	100-50+50 =c(1,00) <sup>1/3-16</sup>	100-50+52 =t <sub>U</sub> log(5,00)+50
light Grey H (paper)	44,8 =20*2,24	71-50+21 =s(0,45) <sup>1/2,4</sup>	2,24 =0,45	72-50+22 =c(0,45) <sup>1/3-16</sup>	75-50+27 =t <sub>U</sub> log(2,24)+50
Grey U (paper)	20	51-50+1 =s(0,20) <sup>1/2,4</sup>	1 =0,20	51-50+1 =c(0,20) <sup>1/3-16</sup>	50-50+2 =t <sub>U</sub> log(1,00)+50
dark Grey D (paper)	8,9 =20/2,24	36-50-13 =s(0,09) <sup>1/2,4</sup>	0,45 =0,09	35-50-14 =c(0,09) <sup>1/3-16</sup>	24-50-23 =t <sub>U</sub> log(0,45)+50
Black N (paper)	4 =20/5	26-50-23 =s(0,04) <sup>1/2,4</sup>	0,20 =0,04	23-50-26 =c(0,04) <sup>1/3-16</sup>	0-50-48 =t <sub>U</sub> log(0,20)+50
Black P2 (glossy paper)	1,9 =20/11,2	18-50-31 =s(0,02) <sup>1/2,4</sup>	0,09 =0,022	14-50-35 =c(0,02) <sup>1/3-16</sup>	24-50-72 =t <sub>U</sub> log(0,09)+50

It is valid: CIE LAB<sub>W</sub>: c<sub>W</sub>=c=116, IEC sRGB<sub>W</sub>: s<sub>W</sub>=s=100, TUBLOG<sub>U</sub>: t<sub>U</sub>=t=50/log(5)=72

feo90-3n

**Colourimetric scaling of achromatic colours between peak white and black.**  
**Relations between tristimulus value Y, luminance L, and lightness L\* of ISO-standards**

Colour (light or paper)	tristimulus values	HDR display luminance	relative luminance	CIE LAB <sub>U</sub> lightness	TUBLOG <sub>U</sub> lightness
Contrast W:N (25:1=100:4)	$Y^{(50.5-2,24)}$ =s <sub>W</sub> L <sub>rw</sub> <sup>1/2,4</sup>	$L_{rw}^{HDR}$ =L/L <sub>W</sub>	$L_{rw}/L_{rw}$ =L/L <sub>W</sub>	$L_{rw}^{IEC LAB_{U1/2,4}}$ =d <sub>U</sub> L <sub>rw</sub> <sup>1/3-16</sup>	$L_{rw}^{TUBLOG_{U1/2,4}}$ =t <sub>U</sub> log(L <sub>rw</sub> )+50
White P2 (light)	500 =20*25	100 =40*25	25 =5,00	100 =d(25,00) <sup>1/3-16</sup>	100-50+102 =t <sub>U</sub> log(25,00)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5 =1,00	100-50+50 =d(5,00) <sup>1/3-16</sup>	100-50+52 =t <sub>U</sub> log(5,00)+50
light Grey H (paper)	44,8 =20*2,24	89,6 =40*2,24	2,24 =0,45	72-50+22 =d(0,45) <sup>1/3-16</sup>	75-50+27 =t <sub>U</sub> log(2,24)+50
Grey U (paper)	20	40 =40*1	1 =0,20	51-50+1 =d(1,00) <sup>1/3-16</sup>	50-50+2 =t <sub>U</sub> log(1,00)+50
dark Grey D (paper)	8,9 =20/2,24	17,8 =40/2,24	0,45 =0,09	35-50-14 =d(0,45) <sup>1/3-16</sup>	24-50-23 =t <sub>U</sub> log(0,45)+50
Black N (paper)	4 =20/5	8 =40/5	0,20 =0,04	23-50-26 =d(0,20) <sup>1/3-16</sup>	0-50-48 =t <sub>U</sub> log(0,20)+50
Black P2 (glossy paper)	1,9 =20/11,2	3,6 =40/11,2	0,09 =0,022	14-50-35 =d(0,09) <sup>1/3-16</sup>	24-50-72 =t <sub>U</sub> log(0,09)+50

It is valid: CIE LAB<sub>U</sub>: d<sub>U</sub>=d=66, TUBLOG<sub>U</sub>: t<sub>U</sub>=t=50/log(5)=72

feo91-3n

**Colourimetric scaling of achromatic colours between peak white and black.**  
**Relations between tristimulus value Y, luminance L, and lightness L\* of ISO-standards**

Colour (light or paper)	tristimulus values	HDR display luminance	relative luminance	CIE LAB <sub>W</sub> lightness	TUBLOG <sub>U</sub> lightness
Contrast W:N (25:1=100:4)	$Y^{(50.5-2,24)}$ =s <sub>W</sub> L <sub>rw</sub> <sup>1/2,4</sup>	$L_{rw}^{HDR}$ =L/L <sub>W</sub>	$L_{rw}/L_{rw}$ =L/L <sub>W</sub>	$L_{rw}^{IEC LAB_{W1/2,4}}$ =c <sub>W</sub> L <sub>rw</sub> <sup>1/3-16</sup>	$L_{rw}^{TUBLOG_{U1/2,4}}$ =t <sub>U</sub> log(L <sub>rw</sub> )+50
White P2 (light)	500 =20*25	100 =40*25	25 =5,00	100 =c(25,00) <sup>1/3-16</sup>	100-50+102 =t <sub>U</sub> log(25,00)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5 =1,00	100-50+50 =c(1,00) <sup>1/3-16</sup>	100-50+52 =t <sub>U</sub> log(5,00)+50
light Grey H (paper)	44,8 =20*2,24	89,6 =40*2,24	2,24 =0,45	72-50+22 =c(0,45) <sup>1/3-16</sup>	75-50+27 =t <sub>U</sub> log(2,24)+50
Grey U (paper)	20	40 =40*1	1 =0,20	51-50+1 =c(0,20) <sup>1/3-16</sup>	50-50+2 =t <sub>U</sub> log(1,00)+50
dark Grey D (paper)	8,9 =20/2,24	17,8 =40/2,24	0,45 =0,09	35-50-14 =c(0,09) <sup>1/3-16</sup>	24-50-23 =t <sub>U</sub> log(0,45)+50
Black N (paper)	4 =20/5	8 =40/5	0,20 =0,04	23-50-26 =c(0,04) <sup>1/3-16</sup>	0-50-48 =t <sub>U</sub> log(0,20)+50
Black P2 (glossy paper)	1,9 =20/11,2	3,6 =40/11,2	0,09 =0,022	14-50-35 =c(0,02) <sup>1/3-16</sup>	24-50-72 =t <sub>U</sub> log(0,09)+50

It is valid: CIE LAB<sub>W</sub>: c<sub>W</sub>=c=116, TUBLOG<sub>U</sub>: t<sub>U</sub>=t=50/log(5)=72

feo90-7n

**Colourimetric scaling of achromatic colours between peak white and black.**  
**Relations between tristimulus value Y, luminance L, and lightness L\* of ISO-standards**

Colour (light or paper)	tristimulus values	HDR display luminance	relative luminance	ITU sRGB <sub>B2</sub> lightness	TUBLOG <sub>U</sub> lightness
Contrast W:N (25:1=100:4)	$Y^{(50.5-2,24)}$ =s <sub>W</sub> L <sub>rw</sub> <sup>1/2,4</sup>	$L_{rw}^{HDR}$ =L/L <sub>W</sub>	$L_{rw}/L_{rw}$ =L/L <sub>W</sub>	$L_{rw}^{ITU sRGB_{B21/2,4}}$ =j <sub>W</sub> L <sub>rw</sub> <sup>0,45-10</sup>	$L_{rw}^{TUBLOG_{U1/2,4}}$ =t <sub>U</sub> log(L <sub>rw</sub> )+50
White P2 (light)	500 =20*25	100 =40*25	25 =5,00	161-50+11 =j(1,00) <sup>0,45-10</sup>	100-50+102 =t <sub>U</sub> log(25,00)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5 =1,00	73-50+23 =j(0,20) <sup>0,45-10</sup>	100-50+52 =t <sub>U</sub> log(5,00)+50
light Grey H (paper)	44,8 =20*2,24	89,6 =40*2,24	2,24 =0,45	48-50+19 =j(0,09) <sup>0,45-10</sup>	75-50+27 =t <sub>U</sub> log(2,24)+50
Grey U (paper)	20	40 =40*1	1 =0,20	30-50-19 =j(0,04) <sup>0,45-10</sup>	50-50+2 =t <sub>U</sub> log(1,00)+50
dark Grey D (paper)	8,9 =20/2,24	17,8 =40/2,24	0,45 =0,09	18-50-31 =j(0,02) <sup>0,45-10</sup>	24-50-23 =t <sub>U</sub> log(0,45)+50
Black N (paper)	4 =20/5	8 =40/5	0,20 =0,04	9-50-40 =j(0,01) <sup>0,45-10</sup>	0-50-48 =t <sub>U</sub> log(0,20)+50
Black P2 (glossy paper)	1,9 =20/11,2	3,6 =40/11,2	0,09 =0,022	4-50-45 =j(0,00) <sup>0,45-10</sup>	24-50-72 =t <sub>U</sub> log(0,09)+50

It is valid: ITU sRGB<sub>B2</sub>: j<sub>W</sub>=j=110, TUBLOG<sub>U</sub>: t<sub>U</sub>=t=50/log(5)=72

feo91-7n

TUB-test chart feo9; Colourimetric scaling of achromatic colours between white and black.

Contrast W:N=100:4, P2:p=1000:3,6; L<sub>rw</sub>, L<sub>rw</sub>. See ISO 2028-5, ITU-R BT.2390-10, sec. 5.31