

see similar files of the whole serie: <http://farbe.li.tu-berlin.de/feos.htm>  
 technical information: <http://farbe.li.tu-berlin.de> or <http://color.li.tu-berlin.de>

**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	IECsRGB <sub>W</sub> lightness	relative luminance		CIELAB <sub>W</sub> lightness	TUBLOG <sub>U</sub> lightness
			L <sub>rU</sub> = L/L <sub>U</sub>	L <sub>rW</sub> = L/L <sub>W</sub>		
<b>Contrast W:N (25:1=100:4)</b>	<b>Y</b> (5 <sup>0.5</sup> =2,24)	<b>L*</b> <sub>IECsRGB<sub>W</sub></sub> =s <sub>W</sub> L <sub>NW</sub> <sup>1/2,4</sup>	<b>L<sub>rU</sub></b> =L/L <sub>U</sub>	<b>L<sub>rW</sub></b> =L/L <sub>W</sub>	<b>L*</b> <sub>CIELAB<sub>W</sub></sub> =c <sub>W</sub> L <sub>NW</sub> <sup>1/3</sup> -16	<b>L*</b> <sub>TUBLOG<sub>U</sub></sub> =t <sub>U</sub> log(L <sub>NU</sub> )+50
White P2 (light)	450 =18*25	195=50+145 =s(5,00) <sup>1/2,4</sup>	25	2,24	182=50+132 =c(5,00) <sup>1/3</sup> -16	150=50+102 =t log(25,00)+50
White P1 (light)	224 =18*11,2	139=50+89 =s(2,24) <sup>1/2,4</sup>	11,2	1,00	135=50+85 =c(2,24) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	90 =18*5	100=50+50 =s(1,00) <sup>1/2,4</sup>	5	0,45	100=50+50 =c(1,00) <sup>1/3</sup> -16	100=50+52 =t log(5,00)+50
Grey U (paper)	18 =18*1	51=50+1 =s(0,20) <sup>1/2,4</sup>	1	0,20	51=50+1 =c(0,20) <sup>1/3</sup> -16	50=50+2 =t log(1,00)+50
Black N (paper)	3,6 =18/5	26=50-23 =s(0,04) <sup>1/2,4</sup>	0,20	0,09	23=50-26 =c(0,04) <sup>1/3</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	2,5 =18/7	21=50-28 =s(0,03) <sup>1/2,4</sup>	0,14	0,04	17=50-32 =c(0,03) <sup>1/3</sup> -16	-14=50-62 =t log(0,13)+50
Black p2 (glossy paper)	1,8 =18/10	18=50-31 =s(0,02) <sup>1/2,4</sup>	0,10	0,022	14=50-35 =c(0,02) <sup>1/3</sup> -16	-24=50-72 =t log(0,09)+50

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

feo20-3n

**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		CIELAB <sub>W</sub> lightness	TUBLOG <sub>U</sub> lightness
			L <sub>rU</sub> = L/L <sub>U</sub>	L <sub>rW</sub> = L/L <sub>W</sub>		
<b>Contrast W:N (25:1=100:4)</b>	<b>Y</b> (5 <sup>0.5</sup> =2,24)	<b>L</b> [cd/m <sup>2</sup> ]	<b>L<sub>rU</sub></b> =L/L <sub>U</sub>	<b>L<sub>rW</sub></b> =L/L <sub>W</sub>	<b>L*</b> <sub>CIELAB<sub>W</sub></sub> =c <sub>W</sub> L <sub>NW</sub> <sup>1/3</sup> -16	<b>L*</b> <sub>TUBLOG<sub>U</sub></sub> =t <sub>U</sub> log(L <sub>NU</sub> )+50
White P2 (light)	450 =18*25	1000 =40*25	25	2,24	182=50+132 =c(5,00) <sup>1/3</sup> -16	150=50+102 =t log(25,00)+50
White P1 (light)	224 =18*11,2	448 =40*11,2	11,2	1,00	135=50+85 =c(2,24) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	90 =18*5	200 =40*5	5	0,45	100=50+50 =c(1,00) <sup>1/3</sup> -16	100=50+52 =t log(5,00)+50
Grey U (paper)	18 =18*1	40 =40*1	1	0,20	51=50+1 =c(0,20) <sup>1/3</sup> -16	50=50+2 =t log(1,00)+50
Black N (paper)	3,6 =18/5	8 =40/5	0,20	0,09	23=50-26 =c(0,04) <sup>1/3</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	2,5 =18/7	5,7 =40/7	0,14	0,04	17=50-32 =c(0,03) <sup>1/3</sup> -16	-14=50-62 =t log(0,13)+50
Black p2 (glossy paper)	1,8 =18/10	4 =40/10	0,10	0,022	14=50-35 =c(0,02) <sup>1/3</sup> -16	-24=50-72 =t log(0,09)+50

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

feo20-7n

**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		CIELAB <sub>U</sub> lightness	TUBLOG <sub>U</sub> lightness
			L <sub>rU</sub> = L/L <sub>U</sub>	L <sub>rW</sub> = L/L <sub>W</sub>		
<b>Contrast W:N (25:1=100:4)</b>	<b>Y</b> (5 <sup>0.5</sup> =2,24)	<b>L</b> [cd/m <sup>2</sup> ]	<b>L<sub>rU</sub></b> =L/L <sub>U</sub>	<b>L<sub>rW</sub></b> =L/L <sub>W</sub>	<b>L*</b> <sub>CIELAB<sub>U</sub></sub> =d <sub>U</sub> L <sub>NU</sub> <sup>1/3</sup> -16	<b>L*</b> <sub>TUBLOG<sub>U</sub></sub> =t <sub>U</sub> log(L <sub>NU</sub> )+50
White P2 (light)	450 =18*25	1000 =40*25	25	2,24	182=50+132 =c(25,00) <sup>1/3</sup> -16	150=50+102 =t log(25,00)+50
White P1 (light)	224 =18*11,2	448 =40*11,2	11,2	1,00	135=50+85 =c(11,20) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	90 =18*5	200 =40*5	5	0,45	100=50+50 =c(5,00) <sup>1/3</sup> -16	100=50+52 =t log(5,00)+50
Grey U (paper)	18 =18*1	40 =40*1	1	0,20	51=50+1 =c(1,00) <sup>1/3</sup> -16	50=50+2 =t log(1,00)+50
Black N (paper)	3,6 =18/5	8 =40/5	0,20	0,09	23=50-26 =c(0,20) <sup>1/3</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	2,5 =18/7	5,7 =40/7	0,14	0,04	17=50-32 =c(0,13) <sup>1/3</sup> -16	-14=50-62 =t log(0,13)+50
Black p2 (glossy paper)	1,8 =18/10	4 =40/10	0,10	0,022	14=50-35 =c(0,09) <sup>1/3</sup> -16	-24=50-72 =t log(0,09)+50

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

feo21-3n

**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		IECsRGB <sub>W</sub> lightness	TUBLOG <sub>U</sub> lightness
			L <sub>rU</sub> = L/L <sub>U</sub>	L <sub>rW</sub> = L/L <sub>W</sub>		
<b>Contrast W:N (25:1=100:4)</b>	<b>Y</b> (5 <sup>0.5</sup> =2,24)	<b>L</b> [cd/m <sup>2</sup> ]	<b>L<sub>rU</sub></b> =L/L <sub>U</sub>	<b>L<sub>rW</sub></b> =L/L <sub>W</sub>	<b>L*</b> <sub>IECsRGB<sub>W</sub></sub> =s <sub>W</sub> L <sub>NW</sub> <sup>1/2,4</sup>	<b>L*</b> <sub>TUBLOG<sub>U</sub></sub> =t <sub>U</sub> log(L <sub>NU</sub> )+50
White P2 (light)	450 =18*25	1000 =40*25	25	2,24	195=50+145 =s(5,00) <sup>1/2,4</sup>	150=50+102 =t log(25,00)+50
White P1 (light)	224 =18*11,2	448 =40*11,2	11,2	1,00	139=50+89 =s(2,24) <sup>1/2,4</sup>	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	90 =18*5	200 =40*5	5	0,45	100=50+50 =s(1,00) <sup>1/2,4</sup>	100=50+52 =t log(5,00)+50
Grey U (paper)	18 =18*1	40 =40*1	1	0,20	51=50+1 =s(0,20) <sup>1/2,4</sup>	50=50+2 =t log(1,00)+50
Black N (paper)	3,6 =18/5	8 =40/5	0,20	0,09	26=50-23 =s(0,04) <sup>1/2,4</sup>	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	2,5 =18/7	5,7 =40/7	0,14	0,04	21=50-28 =s(0,03) <sup>1/2,4</sup>	-14=50-62 =t log(0,13)+50
Black p2 (glossy paper)	1,8 =18/10	4 =40/10	0,10	0,022	18=50-31 =s(0,02) <sup>1/2,4</sup>	-24=50-72 =t log(0,09)+50

It is valid: IECsRGB<sub>W</sub>: s<sub>W</sub>=s=100, TUBLOG<sub>U</sub>: t<sub>U</sub>=t=50/log(5)=72

feo21-7n

TUB-test chart feo2; Colourimetric scaling of achromatic colours between white and black.  
 Contrast W:N=90:3,6, P2:p2=1000:4 with Y<sub>nW</sub>, Y<sub>nU</sub>. See ISO 22028-5, ISO/CIE 11664-4, CIE 230

TUB registration: 20240201-feo2/feo210na.txt / .ps  
 application for evaluation and measurement of display or print output  
 TUB material: code=rh4ta