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TUB registration: 20240201-feo3/feo310np.pdf / .ps  
 application for evaluation and measurement of display or print output  
 TUB material: code=rhata4

**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*</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 P1 (light)	224 =20*11,2	139=50+89 =s(2,24) <sup>1/2.4</sup>	11,2	2,24	135=50+85 =c(2,24) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+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</sup> -16	100=50+52 =t 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</sup> -16	75=50+27 =t 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</sup> -16	50=50+2 =t 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</sup> -16	24=50-23 =t 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</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	1,9 =20/11,2	19=50-30 =s(0,02) <sup>1/2.4</sup>	0,09	0,022	14=50-35 =c(0,02) <sup>1/3</sup> -16	-23=50-71 =t log(0,10)+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, Y<sub>nW</sub>=Y/100, Y<sub>nU</sub>=Y/20

feo30-3n

**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>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*</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 P1 (light)	224 =20*11,2	448 =40*11,2	11,2	2,24	135=50+85 =c(11,20) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5	1,00	100=50+50 =c(5,00) <sup>1/3</sup> -16	100=50+52 =t 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(2,24) <sup>1/3</sup> -16	75=50+27 =t log(2,24)+50
Grey U (paper)	20	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
dark Grey D (paper)	8,9 =20/2,24	17,8 40/2,24	0,45	0,09	35=50-14 =c(0,45) <sup>1/3</sup> -16	24=50-23 =t log(0,45)+50
Black N (paper)	4 =20/5	8 40/5	0,20	0,04	23=50-26 =c(0,20) <sup>1/3</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	1,9 =20/11,2	3,6 40/11,2	0,09	0,022	14=50-35 =c(0,10) <sup>1/3</sup> -16	-23=50-71 =t log(0,10)+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, Y<sub>nW</sub>=Y/100, Y<sub>nU</sub>=Y/20

feo31-3n

**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*</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 P1 (light)	224 =20*11,2	448 =40*11,2	11,2	2,24	135=50+85 =c(2,24) <sup>1/3</sup> -16	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5	1,00	100=50+50 =c(1,00) <sup>1/3</sup> -16	100=50+52 =t 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</sup> -16	75=50+27 =t log(2,24)+50
Grey U (paper)	20	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
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</sup> -16	24=50-23 =t 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</sup> -16	0=50-48 =t log(0,20)+50
Black p1 (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</sup> -16	-23=50-71 =t log(0,10)+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, Y<sub>nW</sub>=Y/100, Y<sub>nU</sub>=Y/20

feo30-7n

**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		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*</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 P1 (light)	224 =20*11,2	448 =40*11,2	11,2	2,24	139=50+89 =s(2,24) <sup>1/2.4</sup>	125=50+77 =t log(11,20)+50
White W (fluorescent paper)	100 =20*5	200 =40*5	5	1,00	100=50+50 =s(1,00) <sup>1/2.4</sup>	100=50+52 =t log(5,00)+50
light Grey H (paper)	44,8 =20*2,24	89,6 =40*2,24	2,24	0,45	71=50+21 =s(0,45) <sup>1/2.4</sup>	75=50+27 =t log(2,24)+50
Grey U (paper)	20	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
dark Grey D (paper)	8,9 =20/2,24	17,8 40/2,24	0,45	0,09	36=50-13 =s(0,09) <sup>1/2.4</sup>	24=50-23 =t log(0,45)+50
Black N (paper)	4 =20/5	8 40/5	0,20	0,04	26=50-23 =s(0,04) <sup>1/2.4</sup>	0=50-48 =t log(0,20)+50
Black p1 (glossy paper)	1,9 =20/11,2	3,6 40/11,2	0,09	0,022	19=50-30 =s(0,02) <sup>1/2.4</sup>	-23=50-71 =t log(0,10)+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, Y<sub>nW</sub>=Y/100, Y<sub>nU</sub>=Y/20

feo31-7n

TUB-test chart feo3; Colourimetric scaling of achromatic colours between white and black.  
 Contrast W:N=100:4, P1:p1=224:1,9 with Y<sub>nW</sub>, Y<sub>nU</sub>. See ISO 22028-5, ISO/CIE 11664-4, CIE 230