

**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
<b>Contrast W:N (25:1=100:4)</b>	$Y$ ( $5^{0,5}=2,24$ )	$L$ [cd/m <sup>2</sup> ]	$L_{rU}$ $=L/L_U$	$L_{rW}$ $=L/L_W$	$L^*_{CIELABW}$ $=c_W L_{rW}^{1/3} - 16$	$L^*_{TUBLOGU}$ $=t_U \log(L_{rU}) + 50$
White P2 (light)	450 $=18*25$	1000 $=40*25$	25	2,24	104=50+54 $=c(2,24)^{1/3} - 16$	103=50+55 $=t \log(11,20) + 50$
White P1 (light)	224 $=18*11,2$	448 $=40*11,2$	11,2	1,00	76=50+26 $=c(1,00)^{1/3} - 16$	78=50+30 $=t \log(5,00) + 50$
White W (fluorescent paper)	90 $=18*5$	200 $=40*5$	5	0,45	54=50+4 $=c(0,45)^{1/3} - 16$	53=50+5 $=t \log(2,24) + 50$
Grey U (paper)	18 $=18*1$	40 $=40*1$	1	0,20	37=50-12 $=c(0,20)^{1/3} - 16$	28=50-19 $=t \log(1,00) + 50$
Black N (paper)	3,6 $=18/5$	8 $=40/5$	0,20	0,09	25=50-24 $=c(0,09)^{1/3} - 16$	3=50-44 $=t \log(0,45) + 50$
Black p1 (glossy paper)	2,5 $=18/7$	5,7 $=40/7$	0,14	0,04	15=50-34 $=c(0,04)^{1/3} - 16$	-21=50-69 $=t \log(0,20) + 50$
Black p2 (glossy paper)	1,8 $=18/10$	4 $=40/10$	0,10	0,022	8=50-41 $=c(0,02)^{1/3} - 16$	-46=50-94 $=t \log(0,09) + 50$

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