

CIELAB colour definition of offset and television systems in reflective and luminous mode

- basis are the standards for the offset reflective system (ORS18) and the television luminous system (TLS00)

C03LSE02

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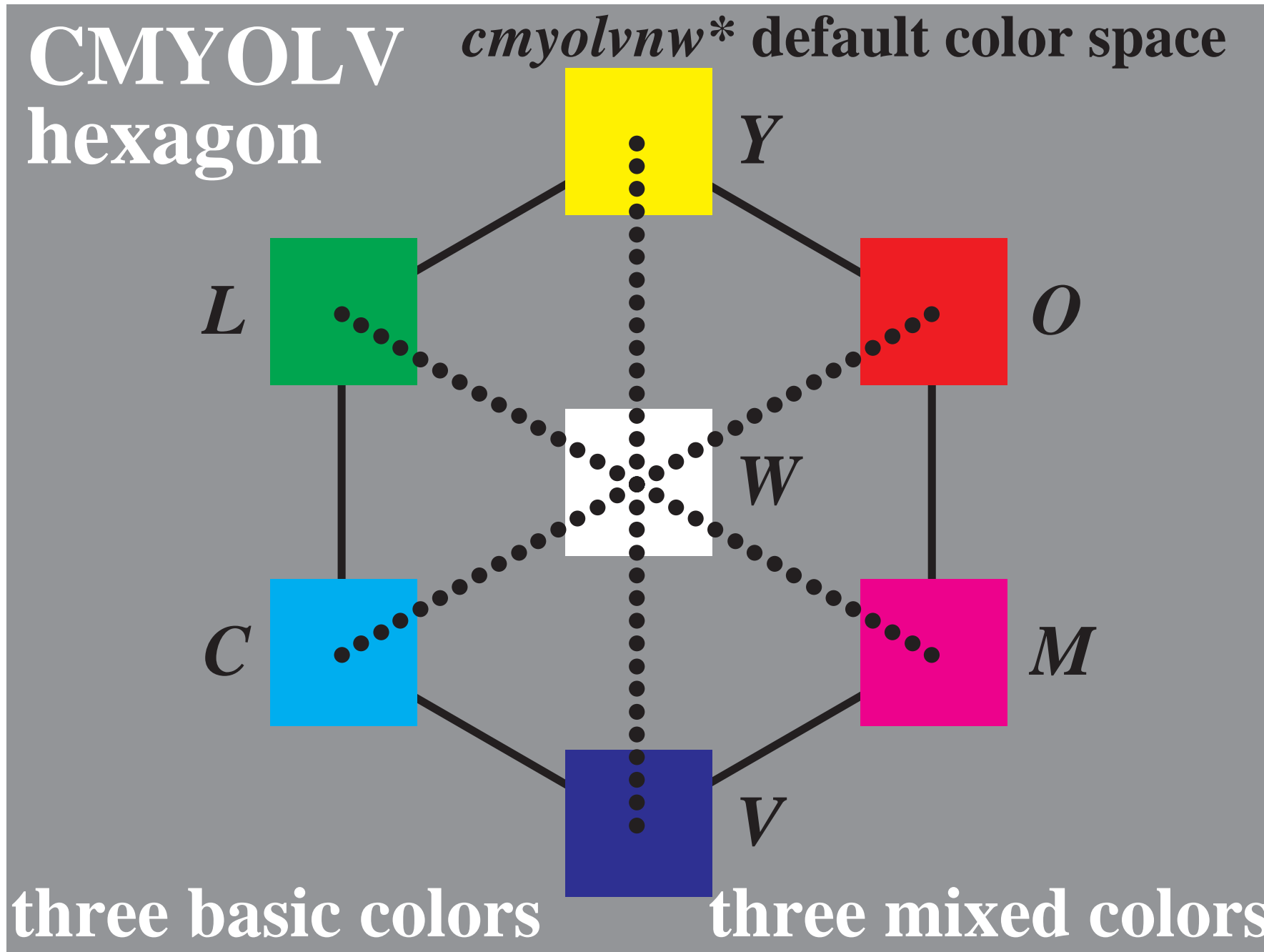
<http://www.ps.bam.de/C03LSE.PDF>

Introduction

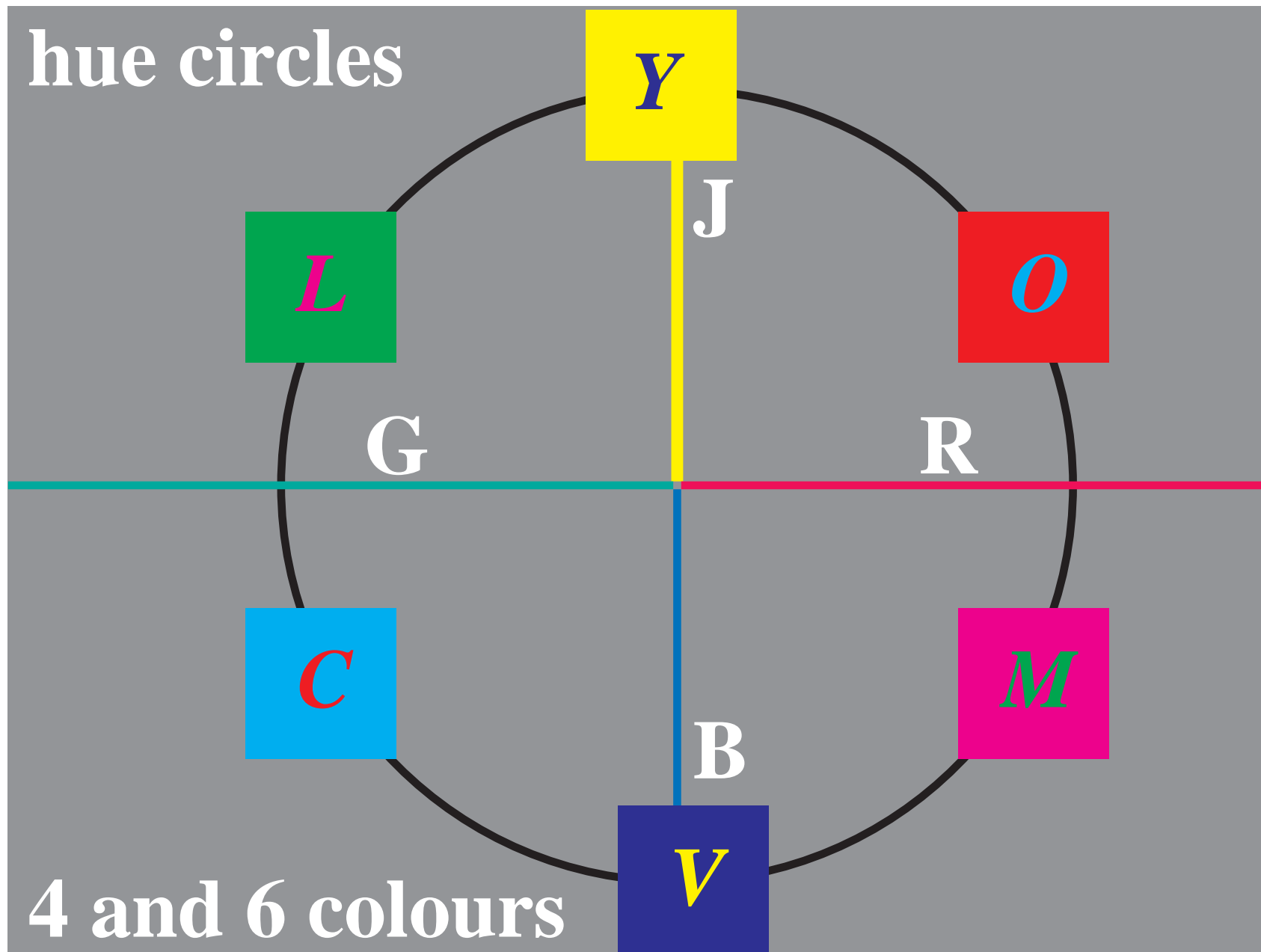
The standards DIN 33866, ISO/IEC 15775 and this paper use the names CMYOLVNW for the 8 reproduction colours and the names RGBJ for the 4 elementary colours shown in Fig.1 and 2.

- The CIELAB data of ISO/IEC 15775 for the Offset Reflective System (ORS=ORS18) with the CIE lightness $L^*=18$ are the basis for the definitions of the four Offset Luminous Systems OLS00, OLS18, OLS27, and OLS33 with CIE lightness $L^*=0, 18, 27, \text{ and } 33$.
- The CIELAB data of ISO/IEC 15775 for the Television Luminous System (TLS=TLS00) with the CIE lightness $L^*=0$ are the basis for the definitions of the Television Reflective System TRS18 and the three Television Luminous Systems TLS18, TLS27, and TLS33 with CIE lightness $L^*=18, 27, \text{ and } 33$.
- The different luminous systems correspond to CIE room light reflections $Y_{re}= 0.0, 2.52, 5.04 \text{ and } 7.56$ on the monitor with $Y_w=89.59$.

Colour hexagon



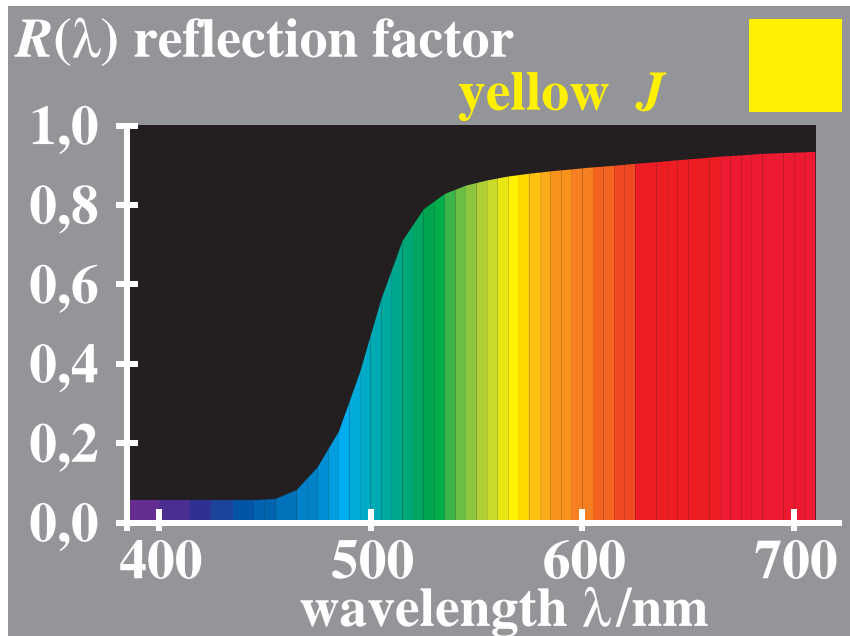
Elementary colour circle



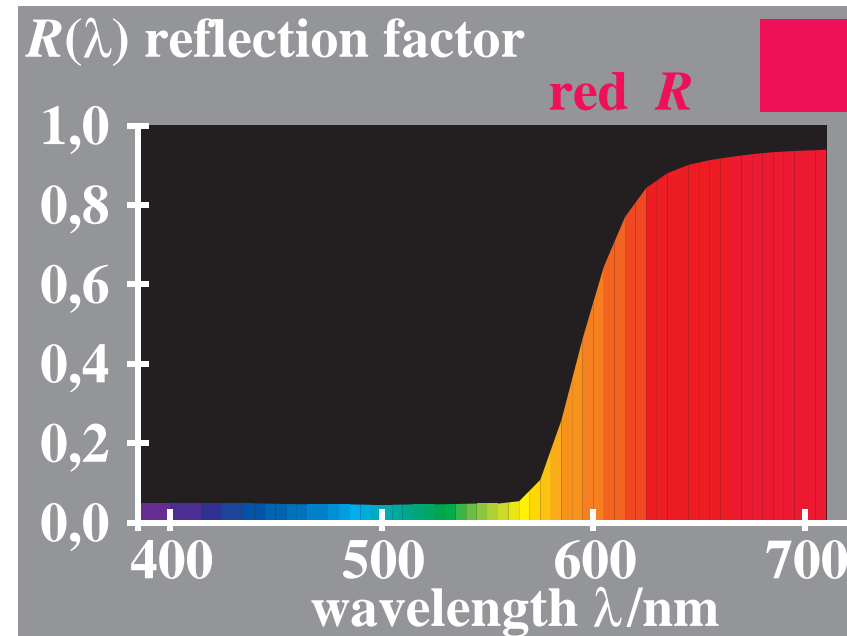
Color-Security '03, Palma de Mallorca, 30.1.-1.2.2003



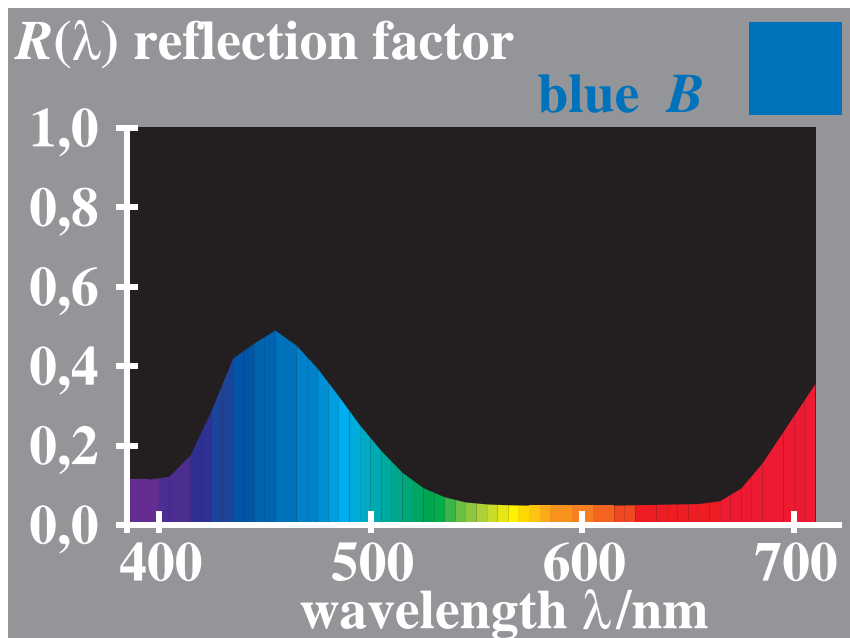
About 4% "White feet" of the reflection factor for all mate surface colours



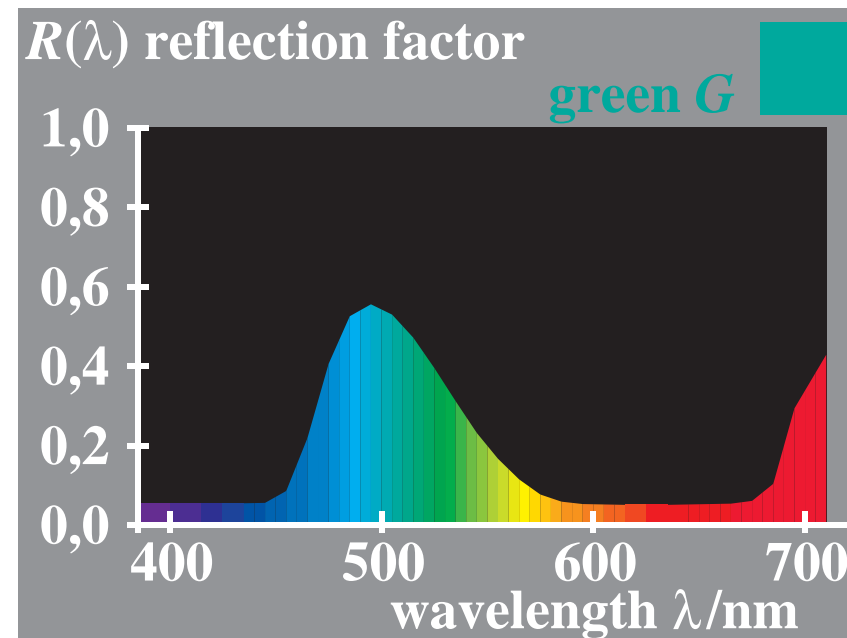
E8141-6



E8141-7



E8141-8



E8150-1

CIELAB data of the Offset Refelction System (ORS18)

Standard offset printing reflective system ORS18						
LAB*_{ra} (Reflective adapted and CIELAB zero point)						
Color	$L^*_{ra}=LAB^*_{ra1}$	$a^*_{ra}=LAB^*_{ra2}$	$b^*_{ra}=LAB^*_{ra3}$	$C^*_{rar}=LAB^*_{rar}$	Y_{ra}	$Y_{ra}/88.59$
C	58.62	-30.34	-45.01	54.3	26.62	0.3005
V	25.72	31.1	-44.4	54.22	4.65	0.0525
M	48.13	75.28	-8.36	75.74	16.9	0.1907
O	47.94	65.39	50.52	82.63	16.75	0.189
Y	90.37	-10.26	91.75	92.32	77.11	0.8703
L	50.9	-62.83	34.96	71.91	19.18	0.2165
N	18.01	0.0	0.0	0.0	2.52	0.0284
W	95.41	0.0	0.0	0.0	88.59	1.0
N0	0.01	0.0	0.0	0.01	0.0	0.0
W1	100.0	0.0	0.0	0.01	100.0	1.1288

LAB*_{rc} (Reflective CIE, $Y_N=2.52$ and CIELAB zero point)						
Color	$L^*_{rc}=LAB^*_{rc1}$	$a^*_{rc}=LAB^*_{rc2}$	$b^*_{rc}=LAB^*_{rc3}$	$C^*_{ab}=LAB^*_{rcr}$	Y_{rc}	$Y_{rc}/88.59$
C	58.62	-30.62	-42.74	52.59	26.62	0.3005
V	25.72	31.45	-44.35	54.38	4.65	0.0525
M	48.13	75.2	-6.79	75.51	16.9	0.1907
O	47.94	65.31	52.07	83.53	16.75	0.189
Y	90.37	-11.15	96.17	96.82	77.11	0.8703
L	50.9	-62.96	36.71	72.89	19.18	0.2165
N	18.01	0.5	-0.46	0.69	2.52	0.0284
W	95.41	-0.98	4.76	4.86	88.59	1.0
N0	0.01	0.84	-1.68	1.89	0.0	0.0
W1	100.0	-1.07	5.06	5.17	100.0	1.1288

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**Offset Reflective System (ORS18) with “White” reflection $Y_r=2.52$.
 Modifications: Offset Luminous Systems OLS00, OLS18=ORS18,
 OLS27, OLS33 for “White” reflections $Y_r=0, 2.52, 5.04$ and 7.56 , see
<http://www.ps.bam.de/C03LS/E6511-7N.PS>**

CIELAB data of the Television Luminous System (TLS00)

Television luminous systems TLS00						
LAB*_{la} (luminous adapted for room reflection Y_r =0.0 and CIELAB zero point)						
Color	L* _{la} =LAB* _{la1}	a* _{la} =LAB* _{la2}	b* _{la} =LAB* _{la3}	C* _{lar} =LAB* _{lar}	Y _{la}	Y _{la} /88.59
C	86.88	-46.15	-13.54	48.11	69.76	0.7874
V (B)	25.72	31.45	-44.28	54.32	4.65	0.0525
M	57.31	94.35	-20.68	96.59	25.24	0.2849
O (R)	50.5	76.91	64.55	100.41	18.84	0.2127
Y	92.66	-20.68	90.75	93.08	82.19	0.9278
L (G)	83.62	-82.74	79.9	115.03	63.35	0.715
N	0.0	0.0	0.0	0.0	0.0	0.0
W	95.41	0.0	0.0	0.0	88.59	1.0
N0	0.0	0.0	0.0	0.0	-2.58	-0.0292
W1	100.13	0.0	0.0	0.0	100.33	1.1325

LAB*_{lc} (luminous CIE for room reflection Y_r =0.0 and CIELAB zero point)						
Color	L* _{lc} =LAB* _{lc1}	a* _{lc} =LAB* _{lc2}	b* _{lc} =LAB* _{lc3}	C* _{lcr} =LAB* _{lcr}	Y _{lc}	Y _{lc} /88.59
C	86.88	-46.15	-13.54	48.11	69.76	0.7874
V (B)	25.72	31.45	-44.28	54.32	4.65	0.0525
M	57.31	94.35	-20.68	96.59	25.24	0.2849
O (R)	50.5	76.91	64.55	100.41	18.84	0.2127
Y	92.66	-20.68	90.75	93.08	82.19	0.9278
L (G)	83.62	-82.74	79.9	115.03	63.35	0.715
N	0.0	0.0	0.0	0.0	0.0	0.0
W	95.41	0.0	0.0	0.0	88.59	1.0
N0	0.0	0.0	0.0	0.0	0.0	0.0
W1	100.13	0.0	0.0	0.0	100.33	1.1325

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Television Luminous System (TLS00) with “White” reflection Y_r=0.0.
Modifications: Television Luminous Systems TLS18=TRS18, TLS27,
TLS33 for “White” reflections Y_r=2.52, 5.04 and 7.56, for data see
<http://www.ps.bam.de/C03LS/E6531-7N.PS>

Transparent test chart 3A according to ISO/IEC 15775

ISO/IEC-test chart no. 3A: equidistant for $Y_{re}=0.0$ room reflection

Grey step no.	Transmission T	CIE tristimulus value Y_{tr}	$Y_{re} = 0.0$ room light reflection $Y = Y_{tr} + Y_{re}$	CIELAB lightness $L^*=0...95$ $\Delta L^*=6,36$
00	0,0000	0,00	0,00	0,00
01	0,0080	0,71	0,71	6,37
02	0,0171	1,52	1,52	12,73
...
14	0,8383	74,27	74,27	89,05
15	1,0000	88,59	88,59*	95,41*

Remark: *normalized as test chart no. 3 according to ISO/IEC 15775

For other intermediate data see

<http://www.ps.bam.de/BAMGREY.PDF>

Transparent test chart 3B according to ISO/IEC 15775

ISO/IEC-test chart no. 3B: equidistant for $Y_{re}=2.52$ room reflection

Grey step no.	Transmission T	CIE tristimulus value Y_{tr}	$Y_{re} = 2.52$ room light reflection $Y = Y_{tr} + Y_{re}$	CIELAB lightness $L^*=18...95$ $\Delta L^*=5,16$
00	0,0000	0,00	2,52	18,01
01	0,0154	1,33	3,85	23,17
02	0,0355	3,06	5,58	28,33
...
14	0,8635	74,32	76,84	90,25
15	1,0000	86,07	88,59*	95,41*

Remark: *normalized as test chart no. 3 according to ISO/IEC 15775

For other intermediate data see

<http://www.ps.bam.de/BAMGREY.PDF>

Transparent test chart 3C according to ISO/IEC 15775

ISO/IEC-test chart no. 3C: equidistant for $Y_{re}=5.04$ room reflection

Grey step no.	Transmission T	CIE tristimulus value Y_{tr}	$Y_{re} = 5.04$ room light reflection $Y = Y_{tr} + Y_{re}$	CIELAB lightness $L^*=27...95$ $\Delta L^*=4,58$
00	0,0000	0,00	5,04	26,74
01	0,0214	1,79	6,79	31,32
02	0,0472	3,95	8,95	35,90
...
14	0,8746	73,11	78,11	90,83
15	1,0000	83,59	88,59*	95,41*

Remark: *normalized as test chart no. 3 according to ISO/IEC 15775

For other intermediate data see

<http://www.ps.bam.de/BAMGREY.PDF>

Transparent test chart 3D according to ISO/IEC 15775

ISO/IEC-test chart no. 3D: equidistant for $Y_{re}=7.56$ room reflection

Grey step no.	Transmission T	CIE tristimulus value Y_{tr}	$Y_{re} = 7.56$ room light reflection $Y = Y_{tr} + Y_{re}$	CIELAB lightness $L^*=33...95$ $\Delta L^*=4,17$
00	0,0000	0,00	7,56	32,92
01	0,0258	2,09	9,59	37,09
02	0,0557	4,52	12,05	41,25
...
14	0,8819	71,52	79,02	91,24
15	1,0000	81,09	88,59*	95,41*

Remark: *normalized as test chart no. 3 according to ISO/IEC 15775

For other intermediate data see

<http://www.ps.bam.de/BAMGREY.PDF>

Summary

The CIELAB data are defined for the eight basic colours *CMYOLVNW* in different offset and television systems

Offset Reflective System (ORS=ORS18)

Offset Luminous System (OLSxx, xx=00, 18, 27, 33 identical to L*N)

Television Reflective System (TRS=TRS18)

Television Luminous System (TLSxx, xx=00, 18, 27, 33)

The CIELAB data of standard systems are defined in ISO/IEC 15775

ORS (=ORS18=PR=Printing) and TLS00 (=TV=Television)

The following systems have identical CIELAB data:

ORS (=ORS18) and OLS18

TRS (=TRS18) and TLS18

Colorimetric equations transform between device independent coordinates CIELAB and the device dependend coordinates *cmyn**, *olv**, *w**, *n** of ORS, TRS, OLSxx, and TLSxx (xx=0, 18, 27, 33) in both directions