

Input	Output	Input and output media and applications			Standard
		Input media	Output media	Application	
–	–	–	–	Basis	DIN 33866–1
analog	analog	DIN-test chart (hardcopy)	Hardcopy	Copier	DIN 33866–2
analog	digital	DIN-test chart (hardcopy)	File	Scanner	DIN 33866–4
digital	analog	DIN-test chart (File)	{ Hardcopy Softcopy	Printer Display	DIN 33866–3 DIN 33866–5

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Input	Output	Input and output media and applications			Standard or TR Technical Report
		Input media	Output media	Application	
–	–	–	–	Basis	ISO/IEC TR 24705
analog	analog	ISO/IEC-test chart (hardcopy)	Hardcopy	Copier	ISO/IEC 15775
analog	digital	ISO/IEC-test chart (hardcopy)	File	Scanner	ISO/IEC TR 24705
digital	analog	ISO/IEC-test chart (File)	{ Hardcopy Softcopy	Printer Display	ISO/IEC TR 24705 ISO/IEC TR 24705

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Input	Output	Input and output media and applications			Technical Report (TR) or Standard	Method & Test: Linearization
		Input media	Output media	Application		
–	–	–	–	Basis	ISO/IEC TR 24705	{ DIN 33866–1 DIN 33872–1
analog	analog	ISO/IEC-file series equally spaced in rgb + ISO/IEC-test chart (hardcopy) series equally spaced in Lch^*	Hardcopy	Copier	ISO/IEC 15775	{ DIN 33866–2 JIS X 6933
analog	digital	ISO/IEC-test chart (hardcopy) series equally spaced in Lch^*	File	Scanner	ISO/IEC TR 24705	DIN 33866–4
digital	analog	ISO/IEC-test chart (File) series equally spaced in rgb	{ Hardcopy Softcopy	Printer Display	ISO/IEC TR 24705 ISO/IEC TR 24705 ISO 9241–306:2008	{ DIN 33866–3 DIN 33872–2,4 DIN 33866–5 DIN 33872–2,4

The ISO/IEC-input linearisation method produces an ISO/IEC-file from an ISO/IEC-original scene:
Flower motif with 16 equidistant grey steps, and 14 CIE-test colours according to CIE 13.3

The ISO/IEC-output linearisation method produces from an ISO/IEC-file a linearized display, offset or printer output:

ISO/IEC-input linearisation method				ISO/IEC-output linearisation method			
Input	Output	Application	Technical Report (TR) or Standard	Input	Output media	Application	Technical Report (TR) or Standard
Original scene + CIE colours	ISO/IEC Image File	Reference Image File	ISO/IEC 15775 ISO/IEC TR 24705	ISO/IEC File	Hardcopy	Printer	ISO/IEC TR 19797
				ISO/IEC File	Softcopy	Display	ISO 9241–306:2008 8 viewing conditions
				ISO/IEC File	{ Softcopy Hardcopy Hardcopy	Display Offset Printer	{ CIE R8–09:2015 device space + device-independent visual RGB* space

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TUB-test chart SN20; colour image reproduction
ISO/IEC Standards & Technical Reports

What is Output Linearization? (For the elementary hues, see CIE R1–47:2009.)
The colour space of a double cone includes 6 colours. The six colours can be the device-dependent device colours (index d): $(R, Y, G, B, N, W)_d$ or the device-independent elementary colours (index e): $(R, Y, G, B, N, W)_e$. Elementary red appears neither yellowish nor bluish. The hue angle is $h_{ab,e} = 26$.

For example for the $sRGB$ colours according to IEC 61966–2–1 it is valid:
Device red R_d has the coordinates rgb^*R_d and $LCh^*R_d = (L^*, C^*_{ab}, h_{ab})_{R_d}$
Elementary red R_e has the coordinates rgb^*R_e and $LCh^*R_e = (L^*, C^*_{ab}, h_{ab})_{R_e}$
Corresponding data are given in the following for R_d , R_e , and $W = W_d = W_e$

$$rgb^*W = (1 \ 1 \ 1)_W$$

$$LCh^*W = (L^*, C^*_{ab}, h_{ab})_W = (95, 0, -)_W$$

$$rgb^*R_d = (1 \ 0 \ 0)_{R_d}$$

$$LCh^*R_d = (50, 100, 40)_{R_d}$$

$$rgb^*R_e = (1 \ 0 \ 0)_{R_e}$$

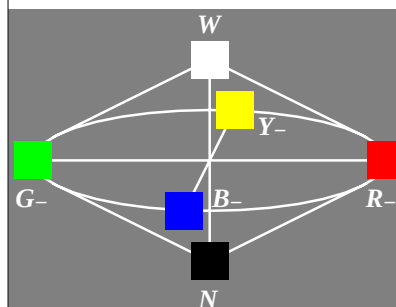
$$LCh^*R_e = (50, 87, 26)_{R_e}$$

Output Linearization of CIE R1–09:2015 produces for the hue angle $h_{ab,R_e} = 26$ the CIELAB data $L^*R_e = 50$ and $C^*_{ab,R_e} = 87$. These CIELAB data are produced with the device to elementary input data (de)

$$rgb_{de,R_e} = (1 \ 0 \ 0, 26)_{de,R_e}$$

A calculated table for 360 hue angles includes:

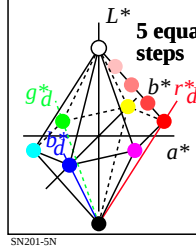
h_{ab}	LCh^*_{de}	rgb_{de}
26	50 87 26	1 0 0,26



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Three device (d) coordinates rgb^*_d describe 8 device colours RGB_d , CMY_d , and NW .

Hexagon-triangle system based on device (d) colours: rgb^*_d with linear relations between rgb^*_d – LCh^*_d (compare approximately linear relations between rgb_{sRGB} and L^*)



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Equations $rgb^*_d - LCh^*_d$ in both directions have been published, see: Richter, CIE-Proceedings, Beijing, 2008, Volume 3 und DIN 33872-1

Three equations (tables) are needed for office applications:

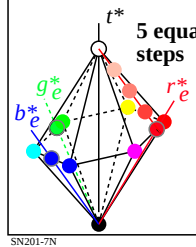
$rgb_d - LCh^*_d$ for a 9x9x9 grid of equally spaced rgb_d input data

$rgb^*_d - LCh^*_d$ a 9x9x9 grid of equally spaced data rgb^*_d and LCh^*_d

$rgb^*_d - LCh^*_d \sim LCh^*_d$ device linearization: $rgb_d \rightarrow rgb^*_d = rgb_{dd}$

Three elementary (e) coordinates rgb^*_e describe 8 colours RGB_e , CMY_e , and NW .

Hexagon-triangle system based on elementary (e) colours: rgb^*_e with linear relations between rgb^*_e – LCh^*_e (compare approximately linear relations between rgb_{sRGB} and L^*)



SN201-7N

Equations $rgb^*_e - LCh^*_e$ in both directions have been published, see: Richter, CIE-Proceedings, Beijing, 2008, Volume 3 und DIN 33872-1

Three equations (tables) are needed for office applications:

$rgb_d - LCh^*_d$ for a 9x9x9 grid of equally spaced rgb_d -input data

$rgb^*_e - LCh^*_e$ a 9x9x9 grid of equally spaced data rgb^*_e and LCh^*_e

$rgb^*_e - LCh^*_e \sim LCh^*_e$ elementary linearization: $rgb_d \rightarrow rgb^*_e = rgb_{de}$

input: w/rgb/cmyk $\rightarrow$ w/rgb/cmyk_d
output: no change compared