sensation scaling functions
lightness L^* and tristimulus value Y

adaptation on surround white W

$$L^*_W = 100\ (Y / 100)^{1/2,0}$$

adaptation on surround grey U

$$L^*_U = 100\ (Y / 100)^{1/2,4}$$

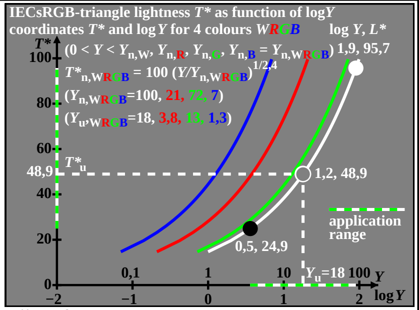
description with CIELAB 1976

$$L^*_{CIELAB} = 116\ (Y / 100)^{1/3,0} - 16$$

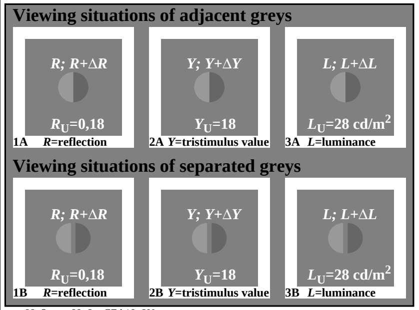
adaptation on surround black N

$$L^*_N = 100\ (Y / 100)^{1/3,0}$$

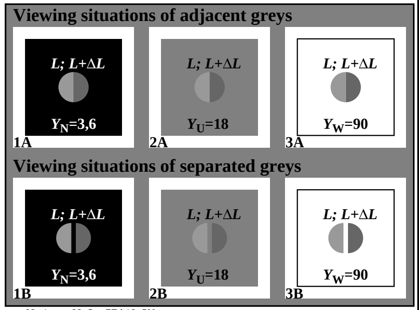
eec00−1a, eea00−4n, CEA10−4N



eec00−2a, eer31−4n



eec00−3a, eea00−2n, CEA10−2N



eec00−4a, eea00−3n, CEA10−3N

eec00−3n

Dynamic range conversion of images with equally spaced *rgb data**
Equally spaced visual output and lightness L^* output with *GammaAdjuster*

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $Y_N=2,5$, $rgb^*_W=1$, $L^*_W=95$, $Y_W=90$, $\Delta L^*=5$, $\gamma_{rel}=1,0$, $\gamma_{rel,i}=1,0$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to 16 test-chart pages according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0PX.PDF, flower motiv with $0,5 \le \gamma_{rel} \le 1$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0NX.PDF, flower motiv with $1 \le \gamma_{rel} \le 2$.
and similar for the ISO series AE49, AE09, AE28 instead of AE18, see
https://standards.iso.org/iso/9241/306/ed-2/index.html.

eec00−5a

Dynamic range conversion of images with equally spaced *rgb data**
Equally spaced visual output and lightness L^* output with *GammaAdjuster*

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *not equally spaced*, $rgb^*_N=0$, $L^*_N=36$, $Y_N=9$, $rgb^*_W=1$, $L^*_W=88$, $Y_W=71$, $\Delta L^*=3$, $\gamma_{rel}=0,8$, $_{rel,i}=1,3$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to 16 test-chart pages according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0PX.PDF, flower motiv with $0,5 \le \gamma_{rel} \le 1$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0NX.PDF, flower motiv with $1 \le \gamma_{rel} \le 2$.
and similar for the ISO series AE49, AE09, AE28 instead of AE18, see
https://standards.iso.org/iso/9241/306/ed-2/index.html.

eec00−6a

Visual definition of γ_{rel} by test-chart output on display
according to ISO 9241-306 with 16 values $0,5 \le \gamma_{rel} \le 2$

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $Y_N=2,5$, $rgb^*_W=1$, $L^*_W=95$, $Y_W=90$, $\Delta L^*=5$, $\gamma_{rel}=1,0$, $\gamma_{rel,i}=1,0$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to one test-chart page according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$:
http://farbe.li.tu-berlin.de/eec4/eec4l0np.pdf, 1080 colors including 729(9x9x9) colors.
http://farbe.li.tu-berlin.de/eec6/eec6l0np.pdf, flower motiv, slide film, +0,5 stops.
http://farbe.li.tu-berlin.de/eec7/eec7l0np.pdf, flower motiv, negative film, +2 stops.
see for papers: https://farbe.li.tu-berlin.de/XY91FEN.html.

eec00−7a

Visual definition of γ_{rel} by test-chart output on display
according to ISO 9241-306 with 16 values $0,5 \le \gamma_{rel} \le 2$

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *not equally spaced*, $rgb^*_N=0$, $L^*_N=36$, $Y_N=9$, $rgb^*_W=1$, $L^*_W=88$, $Y_W=71$, $\Delta L^*=3$, $\gamma_{rel}=0,8$, $_{rel,i}=1,3$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to one test-chart page according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$:
http://farbe.li.tu-berlin.de/eec4/eec4l0np.pdf, 1080 colors including 729(9x9x9) colors.
http://farbe.li.tu-berlin.de/eec6/eec6l0np.pdf, flower motiv, slide film, +0,5 stops.
http://farbe.li.tu-berlin.de/eec7/eec7l0np.pdf, flower motiv, negative film, +2 stops.
see for papers: https://farbe.li.tu-berlin.de/XY91FEN.html.

eec00−8a

eec00−7n

Dynamic range conversion of images with equally spaced *rgb data**
Equally spaced visual output and lightness L^* output with *GammaAdjuster*

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $Y_N=2,5$, $rgb^*_W=1$, $L^*_W=95$, $Y_W=90$, $\Delta L^*=5$, $\gamma_{rel}=1,0$, $\gamma_{rel,i}=1,0$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to 16 test-chart pages according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0PX.PDF, flower motiv with $0,5 \le \gamma_{rel} \le 1$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0NX.PDF, flower motiv with $1 \le \gamma_{rel} \le 2$.
and similar for the ISO series AE49, AE09, AE28 instead of AE18, see
https://standards.iso.org/iso/9241/306/ed-2/index.html.

eec01−1a

Dynamic range conversion of images with equally spaced *rgb data**
Equally spaced visual output and lightness L^* output with *GammaAdjuster*

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- HDR display, HDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *not equally spaced*, $rgb^*_N=0$, $L^*_N=10?$, $rgb^*_W=1$, $L^*_W=160?$, $\Delta L^*=10$ $\gamma_{rel}=1,3$, $_{rel,i}=0,8$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to 16 test-chart pages according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0PX.PDF, flower motiv with $0,5 \le \gamma_{rel} \le 1$.
https://standards.iso.org/iso/9241/306/ed-2/AE18/AE18F0NX.PDF, flower motiv with $1 \le \gamma_{rel} \le 2$.
and similar for the ISO series AE49, AE09, AE28 instead of AE18, see
https://standards.iso.org/iso/9241/306/ed-2/index.html.

eec01−2a

Visual definition of γ_{rel} by test-chart output on display
according to ISO 9241-306 with 16 values $0,5 \le \gamma_{rel} \le 2$

- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- SDR display, SDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $Y_N=2,5$, $rgb^*_W=1$, $L^*_W=95$, $Y_W=90$, $\Delta L^*=5$, $\gamma_{rel}=1,0$, $\gamma_{rel,i}=1,0$

Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to one test-chart page according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$:
http://farbe.li.tu-berlin.de/eec4/eec4l0np.pdf, 1080 colors including 729(9x9x9) colors.
http://farbe.li.tu-berlin.de/eec6/eec6l0np.pdf, flower motiv, slide film, +0,5 stops.
http://farbe.li.tu-berlin.de/eec7/eec7l0np.pdf, flower motiv, negative film, +2 stops.
see for papers: https://farbe.li.tu-berlin.de/XY91FEN.html.

eec01−3a

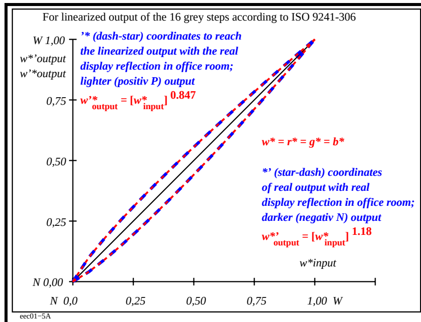
Visual definition of γ_{rel} by test-chart output on display
according to ISO 9241-306 with 16 values $0,5 \le \gamma_{rel} \le 2$

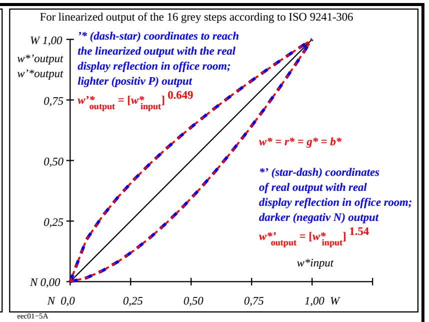
- raw image data (8bit): $0 \le rgb \le 1$ (PhotoCD), *not equally spaced*, search $0 \le rgb_N \le 1$, and $0 \le rgb_W \le 1$
- 16 grey steps, ISO/IEC 15775, ISO 9241-306, standard range
- *Gamma Adjuster* $(rgb^*)^{\gamma_{rel}}$, $\gamma_{rel} = \gamma/2,4$, $1,2 \le \gamma \le 4,8$
- HDR display, HDR range
- visual image (8bit): $0 \le rgb^* \le 1$, *equally spaced between* $rgb^*_N=0$ and $rgb^*_W=1$, $L^*_N=18$ and $L^*_W=95$, $\Delta(rgb^*)=1/15$, $\Delta L^*=5$
- Baseline image: $0 \le rgb^* \le 1$, *equally spaced*, $rgb^*_N=0$, $L^*_N=18$, $rgb^*_W=1$, $L^*_W=95$, $\Delta L^*=5$
- apply γ_{rel}, $\gamma_{rel,i}=1/\gamma_{rel}$, i=invers
- Alternate image: $0 \le (rgb^*)^{\gamma_{rel,i}} \le 1$, *not equally spaced*, $rgb^*_N=0$, $L^*_N=10?$, $rgb^*_W=1$, $L^*_W=160?$, $\Delta L^*=10$ $\gamma_{rel}=1,3$, $_{rel,i}=0,8$

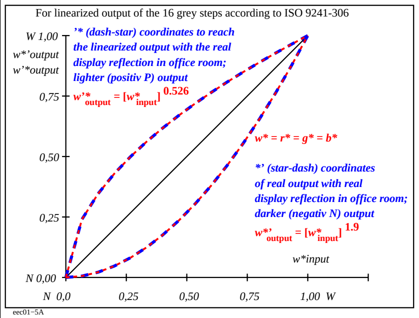
Determine visually the value of γ_{rel} in the range $0,5 \le \gamma_{rel} \le 2$ with the following two test charts.
Links to one test-chart page according to ISO 9241-306 with $0,5 \le \gamma_{rel} \le 2$:
http://farbe.li.tu-berlin.de/eec4/eec4l0np.pdf, 1080 colors including 729(9x9x9) colors.
http://farbe.li.tu-berlin.de/eec6/eec6l0np.pdf, flower motiv, slide film, +0,5 stops.
http://farbe.li.tu-berlin.de/eec7/eec7l0np.pdf, flower motiv, negative film, +2 stops.
see for papers: https://farbe.li.tu-berlin.de/XY91FEN.html.

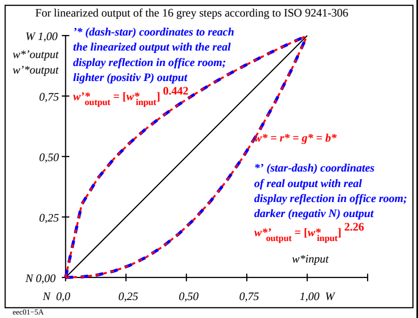
eec01−4a

eec01−3n









eec01−7n

TUB-test chart eec0; Lightness L^* in the colourimetry, relative lightness T^* of the sRGB primary colours according to IEC 61966-2-1, spacing for adjacent and separate samples

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

TUB registration: 20230801-eec0/eec0l0np.pdf /.ps
application for evaluation and measurement of display or print output
TUB material: code=rha4ta