

Melanopic LED action factors

To convert photopic (visual) evaluation parameters into melanopic (biological) evaluation parameters (according to CIE S 026 / E: 2018, DIN SPEC 5031-100).

CRI	Correlated colour temperature*	Luminaire luminous flux	MNER	MDER	MEER
>90	2700 K	4450 lm	1.03	0.48	0.53
	3000 K	4450 lm	1.04	0.55	0.61
	3500 K	4450 lm	1.04	0.65	0.71
	4000 K	4450 lm	1.02	0.72	0.79
	4500 K	4450 lm	1.00	0.78	0.86
	5000 K	4450 lm	0.98	0.83	0.92
	5700 K	4450 lm	0.97	0.89	0.99
	6500 K	4450 lm	0.95	0.95	1.05

CRI: Colour Rendering Index min.

Correlated colour temperature*: Values according to ANSI

Luminaire luminous flux: Luminaire rated luminous flux

MNER: Melanopic Natural Efficacy Ratio

≙ mv, mel, nat (conversion factor relative to the natural reference illuminant, similar to color rendering calculation, at the same correlated color temperature (CCT))

MDER: Melanopic Daylight Efficacy Ratio, CIE S 026/E:2018

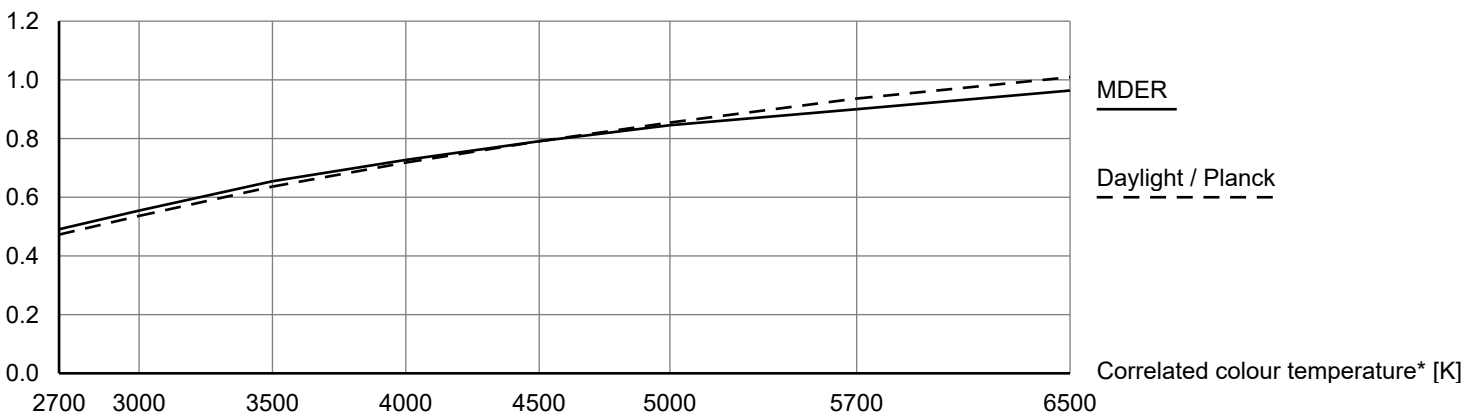
≙ mv, mel, D65 (DIN SPEC 5031-100, conversion factor relative to the D65 illuminant, for the calculation of the melanopic daylight equivalent illuminance)

MEER: Melanopic Equal-energy Efficacy Ratio, CIE S 026/E:2018

≙ R (equivalent Melanopic Lux Metric, Melanopic Ratio)
suitable for calculations for certification according to WELL Building Standard v2 (L03)

Daylight / Planck: Daylight illuminants are used as natural reference illuminant from 5000K on upwards and planckian radiator illuminants are used for lower CCTs.

MDER



Note for the lighting designer:

See supplement on how to calculate melanopic lighting effects or contact our lighting solution planners.

Supplement: https://www.thornlighting.com/PDB/Teaser/EN/TLG_Melanopic-Datasheet-Supplement.pdf

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Notes regarding the conversion of visual evaluation variables into biological evaluation variables

The conversion factors specified in the “Melanopic Data Sheet” can be used to convert the results of a photopic light calculation or measurement into melanopic evaluation variables.



Photopic (visual) evaluation



Melanopic (biological) evaluation

- 1 Reception area of the vertical illuminance at the eye of the observer, relevant for melanopic evaluation
- 2 Light from light source **photopically evaluated** with standard measuring and planning tools
- 3 Light from light source **melanopically evaluated** with formula (photopic value multiplied by factor from Zumtobel data sheet = melanopic value)

Notes regarding melanopic light planning

The specified “melanopic action factors” enable the light planner to perform calculations to determine biological effectiveness (in accordance with CIE S 026/E:2018, DIN SPEC 5031-100, DIN SPEC 67600 and [WELL Building Standard](#)). With regard to the aspects of “Human Centric Lighting” and “Human Centred Design”, these extended planning parameters are attributed increasing importance for optimised light quality and well-being.

The luminaire and its spectrum contribute to the biological effect, but a holistic approach is required: *Integrative, holistic planning includes the application and effects of light in the planning process from the outset and, amongst other things, helps to implement energy-efficient solutions for biologically effective light through suitable use of daylight.**

A holistic planning should take the following aspects into account: *, **, ***

- Luminous intensity (illuminance)
- Changes in the spectrum during transmission
- Changes in the spectrum during reflection
- Changes in the spectrum through absorption
- Area and room angle (geometric arrangement of the light)
- Light direction (geometric arrangement of the light)
- Daytime adapted light
- Season adapted light
- Duration of light exposure
- Spectral and spatial distribution of light over time
- Rapid light changes
- Luminous intensity (illuminance) at other times
- Correction factor for age with melanopic effects of light
- Correction factor for age-dependent reduction of transmission by the eyes
- Correction factor for age-dependent pupil constriction

Another source for planning all aspects of “Human Centric Lighting” is the [licht.wissen 21](#) Guide to Human Centric Lighting (HCL), available free of charge at licht.de.

*DIN SPEC 67600, **DIN SPEC 5031-100, ***No claim to completeness