## 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	3800 lm	1.04	0.48	0.53
	3000 K	3800 lm	1.05	0.55	0.61
	3500 K	3800 lm	1.04	0.65	0.71
	4000 K	3800 lm	1.02	0.72	0.80
	4500 K	3800 lm	1.00	0.78	0.86
	5000 K	3800 lm	0.99	0.83	0.92
	5700 K	3800 lm	0.97	0.90	0.99
	6500 K	3800 lm	0.96	0.96	1.06

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,

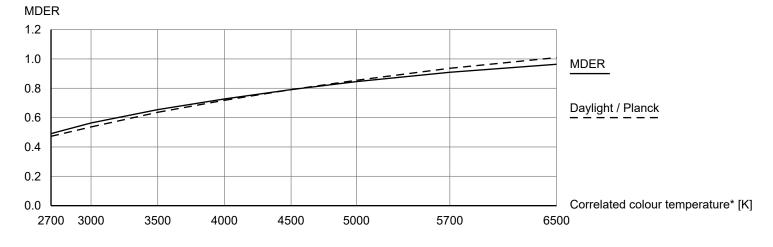
similar to color rendering calculation, at the same correlated color temperature (CCT))

calculation of the melanopic daylight equivalent illuminance)

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

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.



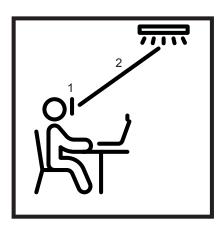
#### Note for the lighting designer:

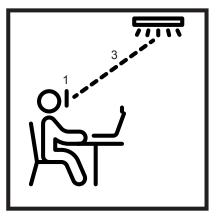
See supplement on how to calculate melanopic lighting effects or contact our lighting solution planners. Supplement: https://www.thornlighting.com/PDB/Teaser/EN/TLG\_Melanopic-Datasheet-Supplement.pdf

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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.





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)

Photopic (visual) evaluation

Melanopic (biological) evaluation

## 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 <u>WELL Building Standard</u>). 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 <u>licht.wissen 21</u> Guide to Human Centric Lighting (HCL), available free of charge at licht.de.