DIN 5031-100:2025-09 (E)

Optical radiation physics and illuminating engineering - Part 100: Melanopic effects of ocular light on human beings - Quantities, symbols and action spectra

Contents

Page

Foreword 4

Introduction 5

1 Scope 6

2 Normative references 6

3 Terms and definitions 6

4 Melanopic effects of light 18
4.1 General 18
4.1.1 Overview of the melanopic effects of light 18
4.1.2 Suppression of melatonin at night 19
4.1.3 Shift of the circadian phase 19
4.1.4 Change of circadian amplitude 20
4.1.5 Activation with light 20
4.1.6 Control of the pupillary reflex 20
4.1.7 Treatment of seasonal affective disorder (SAD) 20
4.2 Melanopic evaluation of light 21
4.3 Action spectrum for the melanopic evaluation of light 21
4.4 Specification of lamp and luminaire data 24
4.4.1 General 24
4.4.2 Melanopic equivalent daylight luminous flux of light sources 24
4.4.3 Melanopic Equivalent Light Output Ratio 26
4.4.4 Melanopic dynamic range of luminaires 26

5 Light technology description of the exposure 26
5.1 Light source description 26
5.2 Exact description for simple light sources 26
5.3 Simplified description for simple light sources 28
5.4 Description for complex light sources 29
5.5 Assessment of photobiological safety 29

Annex A (informative) Spectral power distribution of light sources 30

Annex B (informative) Examples of melanopic equivalent daylight quantities 43

Annex C (informative) Melanopic daylight efficacy ratios, melanopic factors and age-related correction factors 45

C.1 Melanopic daylight efficacy ratios, melanopic factors for age-related lens transmittance 45
C.2 Melanopic daylight efficacy ratios, melanopic factors and correction factors for age-related pupil correction 47

Annex D (informative) Correction factors for the evaluation of the influence of transmission and reflection on the assessment of light with regard to melanopic effects 49

Annex E (informative) Melanopic effects depending on spatial light distribution 50

Bibliography 51

Figures Figure 1 -- Correction factor kmel() according to Equation (18) 13

Figure 2 -- Correction factor kmel() according to Equation (19) 13

Figure 3 -- Action spectrum for melanopic effects of light smel() 23

Figure 4 -- Schematic representation of geometric features for description of light sources 27

Figure A.1 -- Graphical representation of the relative spectral power distributions of white LED types B1 to B5 as in CIE 015, Colorimetry, 4th edition 41

Figure A.2 -- Graphical representation of the spectral power distribution of white LEDs that are not based on a blue-excited phosphor 42

Tables Table 1 -- Spectral optical density D() and spectral transmittance () according to Equation (21) and Equation (22) for the age groups 10, 25, 32, 50, 75 and 90 years as a function of the wavelength 15

Table 2 -- Approximate correction factor for age-related lens transmittance for age A for white light according to Equation (23) 16

Table 3 -- Correction factor for age-related pupillary constriction according to Equation (24) 16

Table 4 -- Luminance-dependent factor c(L) 17

Table 5 -- Melanopic effects of light 19

Table 6 -- Action spectrum for melanopic effects of light smel() as a function of wavelength within the definition range 1 = 380 nm to 2 = 780 nm in 1 nm steps 21

Table 7 -- Comparison of the photopically and melanopically weighted luminous flux for different illuminants 25

Table A.1 -- Spectral power distributions of light sources, normalized to a maximum value of 1 30

Table B.1 -- Compilation of melanopic equivalent daylight quantities 43

Table C.1 -- Melanopic daylight efficacy ratio (MDER), melanopic factor and correction factors CIE 015:2018 45

Table C.2 -- Melanopic daylight efficacy ratio (MDER), melanopic factor and correction factors for age-related lens transmittance for various modern light sources 46

Table C.3 -- Melanopic daylight efficacy ratio (MDER), melanopic factor and correction factors for age-related correction for various LED light sources 47