

# DIN EN 13032-4:2019-11 (E)

## Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 4: LED lamps, modules and luminaires (includes Amendment A1:2019)

---

<b>Contents</b>		<b>Page</b>
	European foreword .....	5
	Introduction .....	6
<b>1</b>	<b>Scope .....</b>	<b>7</b>
<b>2</b>	<b>Normative references .....</b>	<b>7</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>8</b>
<b>4</b>	<b>Laboratory requirements .....</b>	<b>17</b>
4.1	General .....	17
4.1.1	Standard Test Conditions .....	17
4.1.2	Tolerance Interval .....	18
4.2	Laboratory and Environmental Conditions .....	19
4.2.1	Test Room .....	19
4.2.2	Ambient Temperature .....	19
4.2.3	Surface Temperature (tp-Point Temperature) .....	20
4.2.4	Air Movement .....	20
4.2.5	Operating Position .....	21
4.3	Electrical Test Conditions and Electrical Equipment .....	21
4.3.1	Test Voltage and Test Current .....	21
4.3.2	Electrical Measurements .....	21
4.3.3	Electrical Power Supply .....	22
4.4	Stabilization before Measurement .....	23
4.4.1	General .....	23
4.4.2	LED Lamps and LED Luminaires .....	23
4.4.3	LED Modules .....	24
4.5	Photometric and Colorimetric Measurement Instruments .....	24
4.5.1	General .....	24
4.5.2	Spectral Responsivity Requirements for Photometers .....	25
4.5.3	Integrating Sphere (all Types) .....	25
4.5.4	Goniophotometer (all Types) .....	27
4.5.5	Luminance Meters .....	29
<b>5</b>	<b>Preparation, mounting and operating conditions .....</b>	<b>29</b>
5.1	Ageing .....	29
5.2	Test device .....	30
5.3	Mounting .....	30
5.3.1	Operating orientation .....	30
5.3.2	Coordinate system .....	30
5.3.3	Photometric Centre .....	30
5.4	Operating conditions of the LED devices .....	31
5.4.1	General .....	31
5.4.2	LED lamps .....	31
5.4.3	LED modules .....	31
5.4.4	LED luminaires .....	31
<b>6</b>	<b>Measurement of photometric quantities .....</b>	<b>32</b>

6.1	General .....	32
6.2	Measurement of total luminous flux .....	32
6.3	Partial Luminous Flux .....	33
6.3.1	!General" .....	33
6.3.2	!Useful luminous flux (according regulation (EU) No 1194/2012) .....	34
6.4	Luminous efficacy .....	34
6.5	Luminous intensity distribution and data presentation .....	35
6.5.1	General .....	35
6.5.2	LED-lamps and LED-modules .....	35
6.5.3	LED-luminaires .....	35
6.6	Centre beam intensity and beam angles .....	35
6.7	Luminance Measurements .....	36
7	Measurement of colour quantities .....	36
7.1	Colorimetric Measurements .....	36
7.1.1	General aspects .....	36
7.1.2	Correlated Colour Temperature (white LED light sources) .....	37
7.1.3	Colour Rendering Indices (white LED light sources) .....	38
7.1.4	Angular Colour Uniformity .....	38
8	Measurement Uncertainties .....	38
8.1	General .....	38
8.2	Guidance for Measurement uncertainty budgets .....	39
8.2.1	Common parameters to all measurements .....	39
8.2.2	Luminous flux .....	39
8.2.3	Luminous intensity and luminance .....	41
8.2.4	Colour quantities .....	41
8.2.5	Electrical power .....	41
8.2.6	Luminous efficacy .....	42
9	Presentation of test results .....	42
9.1	Test report .....	42
9.1.1	Introduction .....	42
9.1.2	General information .....	42
9.1.3	Information on the device(s) under test .....	42
9.1.4	Information on the test procedure .....	43
9.1.5	Photometric and/or colorimetric data .....	43
Annex A (informative) Guidance on the Application of this standard .....		44
A.1	General .....	44
A.2	Tolerance Interval .....	45
Annex B (informative) Stray light -- Screening against stray light in a goniophotometer .....		46
Annex C (informative) Practical laboratory conditions .....		47
C.1	Correction factors .....	47
C.1.1	Measurement correction factors .....	47
C.1.2	Service conversion factors .....	47
C.2	Sensitivity coefficients .....	47
C.3	Typical Sensitivity coefficients and tolerance intervals .....	48
C.3.1	General .....	48
C.3.2	Ambient temperature .....	48
C.3.3	Measurement of a LED module at Performance Temperature .....	48
C.3.4	Air movement .....	51
C.3.5	Test voltage .....	51
C.3.6	Spectral mismatch of photometer .....	52
C.3.7	Model for Luminous Intensity Distribution .....	54
Annex D (informative) Guidance on calculating measurement uncertainties .....		56

<b>D.1</b>	<b>General .....</b>	<b>56</b>
<b>D.2</b>	<b>Uncertainty budget .....</b>	<b>56</b>
<b>D.3</b>	<b>Example of measurement uncertainties .....</b>	<b>57</b>
<b>Annex E (informative)</b>	<b>Guidance for determining rated values of photometric quantities of LED luminaires .....</b>	<b>63</b>
<b>E.1</b>	<b>Introduction .....</b>	<b>63</b>
<b>E.2</b>	<b>Rating and tolerance of LED-luminaire data .....</b>	<b>63</b>
<b>Annex ZA (informative)</b>	<b>Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EC) No 244/2009 aimed to be covered .....</b>	<b>66</b>
<b>Annex ZB (informative)</b>	<b>Relationship between this European Standard and the ecodesign requirements of Commission Delegated Regulation(EU) No 874/2012 aimed to be covered .....</b>	<b>67</b>
<b>Annex ZC (informative)</b>	<b>Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 1194/2012 aimed to be covered .....</b>	<b>68</b>
<b>Bibliography .....</b>		<b>70</b>