

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)

Contents		Page
	European foreword	5
	Introduction	6
1	Scope	7
2	Normative references	7
3	Terms and definitions	8
4	Laboratory requirements	17
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
5	Preparation, mounting and operating conditions	29
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
6	Measurement of photometric quantities	32

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

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