

Deutsche Akkreditierungsstelle

Annex to the Partial Accreditation Certificate D-PL-11165-04-02 according to DIN EN ISO/IEC 17025:2018

Valid from: 10.06.2024

Date of issue: 10.06.2024

This annex is a part of the accreditation certificate D-PL-11165-04-00.

Holder of partial accreditation certificate:

**TÜV Rheinland Kraftfahrt GmbH
Am Grauen Stein, 51105 Köln**

with the location

**TÜV Rheinland Kraftfahrt GmbH
Lichttechnisches Labor
Rhinstraße 46, 12681 Berlin**

The testing laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The testing laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of testing laboratories and confirm generally with the principles of DIN EN ISO 9001.

This certificate annex is only valid together with the written accreditation certificate and reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at <https://www.dakks.de>.

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Tests in the field of:

Testing of Reflection; Measurement of Retroreflecting Surfaces; Measurement of Colour; Measurement of Spectral Irradiance or Radiance, Luminous Flux, Luminous Intensity and the Luminous Intensity Distribution, Luminance, Illuminance, Illuminance with high temporal resolution (flash light measurement), Refractive Power; Testing the resistance of the surface to damage by small particles; Testing against fogging of translucent surfaces; Testing of Transmission; Testing of Stray Light Proportion; Determination of the Luminance Factor

Within the scope of accreditation, the testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, the following:
the free choice of standard or equivalent testing methods.

The testing laboratory maintains a current list of all testing within the flexible scope of accreditation.

1. Testing of Reflection

Determination of the degree of reflection

DIN 5036-3 1979-11	Radiometric and photometric properties of materials; methods of measurement for photometric and spectral radiometric characteristics <i>5.1 Measurement of Reflectance ρ</i>
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2. Measurement of Retroreflecting Surfaces

Detection of the coefficient of luminous intensity R (CIL), the coefficient of luminous intensity R' by means of a retro-reflection measuring device

CIE 54.2 2001	Retroreflection: Definition and Measurement
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DIN 67520 2013-10	Retro-reflecting materials for traffic safety – Photometric minimum requirements for retro-reflective sheetings <i>5 Measurement and testing methods</i>
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ISO 6742 2015-05	Cycles - Lighting and retro-reflective devices - Photometric and physical requirements: 8 Photometric Test
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3. Measurement of Colour

Spectral method: Measurement of the relative spectral radiant intensity, radiance, radiant flux and irradiance and calculation of the colour coordinates.

Tristimulus method: Integral measurement of the colour coordinates via a spectrally adapted colour measuring head

CIE 15 2004	Colorimetry
DIN 5033-4 1992-07	Colorimetry - Spectrophotometric method
DIN 5033-6 1976-08	Colorimetry - Tristimulus method

4. Measurement of Spectral Irradiance or Radiance

Measurement of the spectral irradiance $E_{e\lambda}$ or radiance $L_{e\lambda}$, calculation of the radiometric quantities radiant intensity I_e , radiant flux Φ_e , irradiance E_e and radiance L_e

DIN 5030-2 1984-12	Spectral measurement of radiation – Emitter for spectral radiation measurements; selection criteria
DIN EN 62471 2009-03	Photobiological safety of lamps and lamp systems (limited to the investigations blue light hazard, photochemical..)
CIE 103 1993	Solariums and home tanning
CIE 157 2004	Control of damage to museum objects by optical radiation

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5. Measurement of Luminous Flux

Measurement of the luminous flux Φ with an Integrating Sphere

CIE 84 1989	The Measurement of Luminous Flux (limited to thermal radiators and electric lamps with direct current supply)
DIN 5032-1 1999-04	Photometry - Part 1: Methods of measurement 9.5 Luminous flux <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
DIN EN 13032-1 2004-10	Light and lighting - Measurement and presentation of photometric data of lamps and luminaires 5.5 Measurement of luminous flux <i>(limited to thermal radiators and electric lamps with direct current supply)</i>

6. Measurement of Luminous Intensity and the Luminous Intensity Distribution

Measurement of luminous intensity in a defined direction or luminous intensity distribution using a goniophotometer

CIE 70 1987	The Measurement of Absolute Luminous Intensity Distribution <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
DIN 5032-1 1999-04	Photometry - Part 1: Methods of measurement 9.4 Luminous intensity <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
DIN EN 13032-1 2004-10	Light and lighting - Measurement and presentation of photometric data of lamps and luminaires 5.4 Measurement of luminous intensity distribution <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
CIE 121-SP1 2009	The photometry and goniophotometry of luminaires <i>(limited to thermal radiators and electric lamps with direct current supply)</i>

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7. Measurement of Luminance

Measurement of the Luminance L with a luminance meter on an optical bench

DIN 5032-1 1999-04	Photometry – Part 1: Methods of measurement 9.3 Luminance L <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
DIN EN 13032-1 2004-10	Light and lighting – Measurement and presentation of photometric data of lamps and luminaires 5.6 Measurement of luminance <i>(limited to thermal radiators and electric lamps with direct current supply)</i>

8. Measurement of Illuminance

Measurement of the Illuminance E on an optical bench at a defined distance

DIN 5032-1 1999-04	Photometry - Part 1: Methods of measurement 9.2 Illuminance E <i>(limited to thermal radiators and electric lamps with direct current supply)</i>
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9. Measurement of Illuminance with high temporal resolution (flash light measurement)

Measurement of the course of illuminance E with high temporal resolution

DIN V ENV 50234 1998-04	Flashing lights - Equipment specifications and tests
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10. Measurement of Refractive Power

Measurement of spherical, astigmatic and prismatic refractive power

DIN EN 167 2002-04	Personal eye-protection - Optical test methods <i>Annex A</i> Method for measuring spherical and astigmatic refractive values in small ranges
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11. Testing of Transmission

Test rig to determine the spectral and/or absolute transmission

DIN 5036-3 1979-11	Radiometric and photometric properties of materials; methods of measurement for photometric and spectral radiometric characteristics <i>5.4 Measurement of the transmittance τ</i>
DIN EN 167 2002-04	Personal eye-protection - Optical test methods <i>6 Determination of the transmittance</i>

12. Testing of Stray Light Proportion

Test bench for determining the stray light proportion

DIN 5036-3 1979-11	Radiometric and photometric properties of materials; methods of measurement for photometric and spectral radiometric characteristics <i>5.5 Measurement of the degree of diffuse transmission τ_d</i>
DIN EN 167 2002-04	Personal eye-protection – Optical test methods <i>4 Testing of stray light</i>

13. Determination of the Luminance Factor

Test rig for determination of the luminance factor

DIN 5036-3 1979-11	Radiometric and photometric properties of materials; methods of measurement for photometric and spectral radiometric characteristics <i>7 Measurement of Luminance Factor β and Luminance coefficient q</i>
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The tests can be carried out within the following parameters:

Type of test	Measurand	Measuring range	smallest achievable measurement uncertainty (k = 2)	Characteristic test procedure
Retroreflection	Coefficient of luminous intensity (CIL Reflection value R) Coefficient of retro-reflection (Specific reflection value R')	0,1 mcd/lx ... 199.900 mcd/lx 0,01 cd/lx/m ² ... 19.990 cd/lx/m ² Observation angle 0,100° ... 4,000°	3,6%	CIE 54.2
Radiometry	spectral and integral radiance	250 ... 1000 nm	3%	DIN 5030-2
	spectral and integral radiance	250 ... 1000 nm	4,4%	DIN 5030-2
	spectral and integral radiation power	250 ... 1000 nm	3%	DIN 5030-2
	spectral and integral irradiance	250 ... 1000 nm	2,4%	DIN 5030-2
Photometry	Light intensity	10 ⁻² ... 2·10 ⁶ cd	2%	CIE 70 DIN 5032 DIN EN 13032
	Luminance	10 ⁻³ ... 2·10 ⁶ cd/m ²	3,4%	DIN 5032 DIN EN 13032
	Illuminance	10 ⁻³ ... 2·10 ⁵ lx	2%	DIN 5032 DIN EN 13032
	Luminous flux	10 ⁻³ ... 2·10 ⁶ lm	3%	CIE 84 DIN 5032 DIN EN 13032
	light color	CIE color space x, y	±0,001	CIE 15
Goniometry	Angle	H: -180° ... 180° V: -40° ... 90°	±0,005°	CIE 70 CIE 121
Refractive power	Spherical and astigmatic	0,01 ... 1,00 dpt	4,5% min. 0,015dpt	DIN EN 167 UNECE-R 22
Transmission		0% ... 100%	0,5% for spectrally selective samples	DIN 5036-3 DIN EN 167
Reflection		0 ... 100%		DIN 5036-3
Stray Light	Degree of stray light with diffuse transmitting materials	0,1% ... 50%	2% relative measurement	DIN 5036-3 DIN EN 167

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Abbreviations used:

CIE	Commission Internationale de l'Éclairage (International commission for lighting)
DIN	German institut for standardisation
EN	European Standard
ISO	International Organization for Standardisation
IEC	International Electrotechnical Commission

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