74 LED light sources

Refer to: R128 00-S2

74.1 Effective Date and Scope:

74.1.1 Effective date from 2017/1/1, the new types of LED replaceable light sources and from 2019/1/1 the all types of LED replaceable light sources used in safety type approval lamps of vehicle category M, N, O and L, shall comply with this regulation.

74.1.2 The applicants applying for low volume safety type approval may be exempt from regulation of “LED light sources” except for large passenger vehicle and child-only vehicle.

74.1.3 Applying for vehicle-by-vehicle low volume safety type approval, the vehicle may be exempt from regulation of “LED light sources”.

74.2 Definitions

74.2.1 Rated voltage: voltage (in volts) marked on the LED light source.

74.2.2 Test voltage(s): voltage(s) or voltage range(s), at the LED light sources terminals for which the electrical and photometric characteristics of the LED light sources are intended and are to be tested.

74.2.3 Objective values: Design value of an electrical or photometric characteristic. To be achieved, within the specified tolerances, when the LED light source is energized at relevant test voltage.

74.2.4 Standard (etalon) LED light source: Special LED light source used for the testing of lighting and light-signalling devices. It has reduced tolerances for dimensional, electrical and photometric characteristics as specified on the relevant data sheet. Standard LED light sources are specified in only one voltage rating for each category.

74.2.5 Reference axis: an axis defined with reference to the cap and to which certain dimensions of the LED light sources are referred;

74.2.6 Reference plane: a plane defined with reference to the cap perpendicular to the reference axis and to which certain dimensions of the LED light sources are referred.

74.2.7 Light centre: a point on the reference axis at a defined distance from the reference plane that represents the nominal origin of the visible radiation emitted.

74.2.8 Light centre length: the distance between the reference plane and the light centre

74.2.9 Viewing axis on to the LED light source: an axis through the light centre at defined polar and azimuthal angle used to characterize photometrical properties of the LED light source.

74.2.10 Apparent light emitting area: area that contains the (apparent) element of visible radiation when observed under a certain viewing axis. The apparent light emitting area is defined in a plane that contains the light centre and that is perpendicular to the corresponding viewing axis.

74.2.11 Normalized luminous intensity: luminous intensity divided by the luminous flux of the light source in order to characterize the angular radiation pattern of the LED light source.

74.2.12 Cumulative luminous flux: luminous flux emitted by the light source under operating conditions, within a cone enclosing the specified solid angle and centred on the reference axis1.

74.2.13 Light emitting diode (LED) light source: a light source where the element for visible radiation is one or more solid state junctions producing injection-luminescence and/or fluorescence.

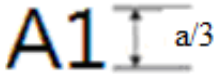
74.2.14 Specifications marked

74.2.14.1 Means the marks shall be clearly legible on the outside of the marking material and shall be indelible to include below:

74.2.14.1.1 Brand (or marking).

74.2.14.1.2 The rated voltage.

74.2.14.1.3 The designation of the relevant category (figure as below , “a” is at least 2.5 mm).



74.3 The principles of applicable type and scope of LED light sources shall be as below:

74.3.1 The same brand. LED light sources bearing the same brand but produced by different manufacturers are considered as being of different types.

74.3.2 The same light source design, in so far as these differences affect the optical results.

74.3.3 The same rated voltage.

74.4 Technical requirements

74.4.1 Visual appearance

74.4.1.1 The replaceable LED light sources of using lamp in Direction shall comply with this regulation.

74.4.1.2 LED light sources shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture.

74.4.1.3 LED light sources shall exhibit no scores or spots on their optical surfaces which might impair their efficiency and their optical performance.

74.4.1.4 LED cap of light sources shall conform to the characteristics given in IEC Publication 60061 and apply to LED types of light source.

74.4.1.5 The cap shall be strong and firmly secured to the rest of the LED light source holder.

74.4.1.6 To ascertain whether LED light sources conform to the requirements of paragraphs 74.4.1.3 to 74.4.1.5 above, a visual inspection, a dimension check and, where necessary, a trial fitting into the holder as specified in IEC publication 60061 shall be carried out.

74.4.1.7 The solid state of semiconductor material junction(s) shall be the only element(s) of the LED light source that generate and emit light, either directly or via fluorescence-based conversion, when energized.

74.4.2 Tests

74.4.2.1 LED light sources shall first be aged at their test voltage for at least forty-eight hours. For multi-function LED light sources, each function shall be aged separately.

74.4.2.2 Unless otherwise specified, electrical and photometric measurements shall be carried out at the relevant test voltage(s).

74.4.2.3 Electrical measurements as specified in paragraphs 74.5 shall be carried out with instruments of at least class 0.2 (0.2 per cent full scale accuracy).

74.4.3 Position and dimensions of apparent light emitting area

74.4.3.1 The position and dimensions of the apparent light emitting area shall conform to the requirements as given on the relevant data sheet.

74.4.3.2 The measurement shall be made after ageing the LED light source according to paragraph 74.4.2.1.

74.4.4 Luminous flux

74.4.4.1 When measured according to the conditions specified in paragraphs 74.5, the luminous flux shall be within the limits given on the relevant data sheet.

74.4.4.2 The measurement shall be made after ageing the LED light source according to 74.4.2.1.

74.4.5 Normalized luminous intensity distribution / cumulative luminous flux distribution

74.4.5.1 When measured according to the test conditions specified in paragraphs 74.5 , the normalized luminous intensity distribution and/or cumulative luminous flux distribution shall be within the limits given on the relevant data sheet.

74.4.5.2 The measurement shall be made after ageing the LED light source according to paragraph 74.4.2.1.

74.4.6 Colour

74.4.6.1 The colour of the light emitted by the LED light sources shall be specified on the relevant data sheet. The definitions of the colour of the light emitted, given in “The installation of lighting and light-signalling devices” and its series of amendments in force at the time of application for type approval shall apply to this Regulation.

74.4.6.2 The colour of the light emitted shall be measured by the method specified in paragraphs 74.5. Each measured value shall lie within the required tolerance area.

74.4.6.3 Moreover, in the case of LED light sources emitting white light, the minimum red content of the light shall be such that:

$$k_{red} = \frac{\int_{\lambda=610nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda}{\int_{\lambda=380nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda} \geq 0.05$$

where:

Ee(lambda) (unit: W) is the spectral distribution of the irradiance;

V(lambda) (unit: 1) is the spectral luminous efficiency;

lambda (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometer.

74.4.7 UV-radiation

The UV-radiation of the LED light source shall be such that the LED light source is of the low UV type complying with:

$$k_{UV} = \frac{\int_{\lambda=250nm}^{400nm} E_e(\lambda)S(\lambda)d\lambda}{k_m \int_{\lambda=380nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda} \leq 10^{-5} W/lm$$

where:

S(lambda)(unit: 1) is the spectral weighting function;

km = 683 lm/W is the maximum value of the luminous efficacy of radiation.

This value shall be calculated using intervals of one nanometer.

The UV-radiation shall be weighted according to the S(lambda) values as indicated in the Table below:

lambda	S(lambda)	lambda	S(lambda)
250	0.430	330	0.00041
255	0.520	335	0.00034
260	0.650	340	0.00028
265	0.810	345	0.00024
270	1.000	350	0.00020
275	0.960	355	0.00016
280	0.880	360	0.00013
285	0.770	365	0.00011
290	0.640	370	0.000090
295	0.540	375	0.000077
300	0.300	380	0.000064
305	0.060	385	0.000053
310	0.015	390	0.000044
315	0.003	395	0.000036
320	0.001	400	0.000030
325	0.00050		

74.4.8 Standard LED light sources: Standard LED light sources shall comply with corresponding relevant data sheets of light source type.

74.5 Method of measurement of electrical and photometrical characteristics

Light sources of all categories with integrated heatsink shall be measured at ambient temperature of (23 +/-2) deg. C in still air. For these measurements the minimum free space as defined in the data sheets shall be maintained.

Light sources of all categories with definition of a temperature Tb shall be measured by stabilising the Tb point at the specific temperature defined on the category data sheet.

74.5.1 Luminous flux

74.5.1.1 A luminous flux measurement using an integrating method shall be made

(a) In case of an integrated heatsink after 1 minute and after 30 minutes of operation or

(b) After stabilisation of the temperature at the Tb point.

74.5.1.2 The luminous flux values, as measured after

(a) 30 minutes, or

(b) Stabilisation of temperature Tb

74.5.1.2.1 Shall comply with the minimum and maximum requirements.

74.5.1.2.2 In case of (a) above this value shall be in between 100 per cent and 80 per cent of the value measured after 1 minute.

74.5.1.3 Measurements have to be carried out at relevant test voltage and at the minimum and maximum values of the relevant voltage range. Unless specified more tightly on the data sheet the following deviation of the luminous flux at the tolerance interval limits shall not be exceeded.

Rated voltage	Min voltage	Max voltage
6	6.0	7.0
12	12.0	14.0
24	24.0	28.0
Corresponding luminous flux tolerance*	+/-30%	+/-15%

*: The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. In between test voltage and voltage range limits the luminous flux behaviour shall be substantially uniform.

74.5.2 Normalized luminous intensity/ cumulative luminous flux

74.5.2.1 In Measuring below

(a) 30 minutes of stabilization time or

(b) Stabilisation of temperature Tb at the value given in the relevant data sheet.

74.5.2.2 Measurements have to be carried out at relevant test voltage.

74.5.2.3 Normalized luminous intensity of a test sample is calculated by dividing the luminous intensity distribution as measured under paragraph 74.5.2.1. by the luminous flux as determined after 30 minutes under paragraph 74.1.2.

74.5.2.4 Cumulative luminous flux of a test sample is calculated according to CIE publication 84-1989, section 4.3 by integrating the luminous intensity within a cone enclosing a solid angle.

74.5.3 Colour

The colour of the light emitted as measured under the same conditions as described paragraph in 74.5.1.1. shall both be within the required colour boundaries.

74.5.4 Power consumption

74.5.4.1 A power consumption measurement shall be made under the same conditions as described in paragraph 74.5.1.1 using the requirements of paragraph 74.4.2.3.

74.5.4.2 Power consumption measurements shall be carried out at relevant test voltage.

74.5.4.3 Values obtained shall comply with the minimum and maximum requirements of the relevant data sheet.