

# **BLUE ANGEL**

**The German Ecolabel**



**Household Lamps**

**DE-UZ 151**

**Basic Award Criteria**

**Edition September 2014**

**Version 3**

**The Environmental Label is supported by the following four institutions:**



The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety is the owner of the label. It regularly provides information on the decisions taken by the Environmental Label Jury.



The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labeling and Environmentally friendly Procurement" acts as office of the Environmental Label Jury and develops the technical criteria of the Basic Criteria for Award of the Blue Angel.



The Environmental Label Jury is the independent, decision-making body for the Blue Angel and includes representatives from environmental and consumer associations, trade unions, industry, the trade, crafts, local authorities, academia, the media, churches, young people and the German federal states.



The RAL gGmbH is the awarding body for the Environmental Label. It organises the process for developing the relevant award criteria in independent expert hearings – which involve all relevant interest groups.

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**This document is a translation of a German original. In case of dispute, the original document should be taken as authoritative.**

# 1 Introduction

## 1.1 Preface

In cooperation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the German Environmental Agency and considering the results of the expert hearings conducted by RAL gGmbH, the Environmental Label Jury has set up these Basic Criteria for the Award of the Environmental Label. RAL gGmbH has been tasked with awarding the Environmental Label.

Upon application to RAL gGmbH and on the basis of a Contract on the Use of the Environmental Label to be concluded with RAL gGmbH, the permission to use the Environmental Label may be granted to all products, provided that they comply with the requirements as specified hereinafter.

The product must comply with all the legal requirements in the country in which it is to be marketed. The applicant shall declare that the product meets this requirement.

## 1.2 Objective of the Blue Angel Eco-Label

Climate protection, reduction of energy consumption as well as the avoidance of harmful substances and waste are key objectives of environmental protection.

Lighting accounts for 10 percent of all electricity used in Germany (in comparison: EU 16 % and worldwide 19 %). German households use about 8 percent of the electricity for lighting. Thus, electricity consumption for lighting of a statistical average German household adds up to almost 300 kWh per year.

Due to this importance of lighting to the above-mentioned objectives of environmental protection the aim of a Blue Angel eco-label for lamps is to support increased market penetration of products with the following properties:

- verified by measurement:
  - ♦ high energy efficiency; minimum A+
  - ♦ good colour rendering
  - ♦ low variation of colour temperature and light colour
  - ♦ high lumen maintenance
  - ♦ high switching endurance
  - ♦ low premature failure rate
  - ♦ low UV radiation and electromagnetic field radiation
- absence of mercury

Blue Angel eco-labelled lamps shall be accompanied by reliable consumer information. Therefore it will be checked whether the consumer information on the product packaging and on the Web provides all the details required under EC and EU regulations. In addition, the measured values submitted for award of the Blue Angel eco-label will be compared with these manufacturer data.

Therefore, following benefits for the environment and health are stated in the explanatory box:



[www.blauer-engel.de/uz151](http://www.blauer-engel.de/uz151)

- energy efficient
- low emissions
- high quality of lamp light

## 2 Scope

These Basic Criteria apply to lamps typically used for household lighting which fulfil the following prerequisites: They

- are directly powered from the mains (230 V, 50 Hz) and therefore need no external ballast, power supply pack or the like;
- are suitable for indoor use;
- have a total luminous flux  $\Phi$  of  $60 \leq \Phi \leq 6500$  lumens (lm) and
- are free from mercury<sup>1</sup>.

Excluded from the scope are:

- lamps where<sup>2</sup>:
  - ♦ at least 6 percent of the total radiation between 250 and 780 nm fall in the range of 250 to 400 nm,
  - ♦ the radiation peak is between 315 and -400 nm (UVA) or between 280 and 315 nm (UVB);
- lamps that allow shifting the chromaticity coordinates to outside the white area<sup>3</sup>;
- double-ended lamps.

## 3 Requirements

### 3.1 Accredited Laboratories

All compliance verification documents to be submitted under these Basic Award Criteria – except for those specified in para. 3.9 – shall be prepared by a DIN EN ISO/IEC 17025-accredited laboratory. The applicant shall bear the costs associated therewith.

#### **Compliance Verification**

*The certification documents of the laboratories concerned shall be presented in Annex 2.*

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<sup>1</sup> i.e. the level of mercury is below detection limit, at the most.

<sup>2</sup> The following two exceptions conform to those set forth in EC Regulation 244/2009/EC.

<sup>3</sup> This is the case if the chromaticity coordinates  $x$  and  $y$  – see Regulation 244/2009/EC – are as follows:

- $x < 0.200$  or  $x > 0.600$  and/or
- $y < -2.3172 x^2 + 2.3653 x - 0.2800$  or  
 $y > -2.3172 x^2 + 2.3653 x - 0.1000$

### 3.2 General Information on Measurements

Unless otherwise specified, the following basic conditions shall apply:

Sample size: 20 lamps

Beginning of measurement: following a stabilization period of 60 minutes.

### 3.3 Energy Efficiency

As regards energy efficiency, the lamps must be rated A+ or above pursuant to Regulation 874/2012/EU.

Energy efficiency classes for lamps pursuant to 874/2012/EU, Annex VI:

| Energy efficiency class | Energy efficiency index (EEI) for non-directional lamps | Energy efficiency class (EEI) for directional lamps |
|-------------------------|---|---|
| A++                     | $EEI \leq 0.11$   | $EEI \leq 0.13$                                     |
| A+                      | $0.11 < EEI \leq 0.17$                                  | $0.13 < EEI \leq 0.18$                              |

#### **Compliance Verification**

*The applicant shall declare compliance with the requirement in Annex 1 to the Contract and present a corresponding test report on the measurements as Annex 3 as well as the technical documents<sup>4</sup> according to Regulation 874/2012/EU as Annex 4.*

### 3.4 Power Factor

Lamps applying for the Blue Angel eco-label shall have a power factor  $\geq 0.75$ .

#### **Compliance Verification and Test Method**

##### **Sample Size and Method**

*The power factor shall be determined by measurement on 5 lamps.*

##### **Evaluations**

*The 5 power-factor values shall be averaged and the resulting average shall be compared with the above-mentioned minimum value.*

##### **Documents to be submitted**

*The applicant shall confirm compliance with the criterion in Annex 1 to the Contract. To verify compliance with these requirements the applicant shall submit a measurement protocol as Annex 5 and specify the basis of value determination.*

### 3.5 Quality and Fitness for Use

#### 3.5.1 Quality of the Lamp Light: Colour Rendering

The general colour rendering index Ra (average R1 ...R8) of the lamp according to DIN 6169 shall be greater than or equal to 83 for a 10-°-standard observer after 0<sup>5</sup>, 1000 and 2000 hours of burning.

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<sup>4</sup> See Annex III to Regulation 874/2012/EU.

<sup>5</sup> i.e. the moment when the lamp is switched ON for the first time.

## **Compliance Verification and Test Method**

### **Measurement Method**

The lamps shall be put in a switching cycle of 165 minutes "ON" and 15 minutes "OFF". The general colour rendering index  $R_a$  shall be determined at three points in time during the test – after 0, 1000 and 2000 hours of burning.

### **Documents to be submitted**

The applicant shall confirm compliance with the criterion in Annex 1 to the Contract. To verify compliance with these requirements the applicant shall submit the corresponding measurement protocols as Annex 6.

Indication of the colour rendering index shall include the following details on the basis of DIN 6169-2:

- chromaticity of the source in the CIE 1976  $u'-v'$ -system in accordance with CIE 15:2004,
- type of reference illuminant,
- individual specific colour rendering indices  $R_1$  to  $R_8$  and
- general colour rendering index  $R_a$ .

## **3.5.2 Quality of the Lamp Light: Variation of the Correlated Colour Temperature**

### **Chromaticity Coordinates**

The chromaticity coordinates of a lamp should not differ too much from the manufacturer-specified chromaticity coordinates of the colour temperature (advertising, packaging, etc.).

That is why the colour distance between the chromaticity of a test sample and the chromaticity of the specified colour temperature after 0 hours in 19 of the 20 test samples shall not be greater than 0.007 units in the CIE 1976  $u'-v'$  chromaticity diagram.

The chromaticity of each test sample shall fall within the corridor of the correlated colour temperature according to DIN 6169-2.

### **Colour Homogeneity**

The chromaticities of type-identical lamps should not differ too much from each other. That is why the colour distance between the chromaticity of one test sample and the chromaticity of any other test sample at 0 hours in 19 out of the 20 test samples must not exceed 0.006 units in the CIE 1976  $u'-v'$  diagram.

### **Hue Preservation**

The chromaticity of a lamp should not change too much over the lamp's lifetime. That is why the colour distance between the chromaticity of a test sample at 2000 hours and the chromaticity of the respective same test sample at 0 hours in 4 test samples must not exceed 0.007 units in the CIE 1976  $u'-v'$  diagram. The variation shall be individually determined for each test sample.

### **Compliance Verification**

The chromaticity shall be determined in accordance with CIE 15:2004 and as an integral over the full space. This can be done goniometrically or in an Ulbricht sphere that meets the requirements of CIE 84:1989.

The applicant shall confirm compliance with the criterion in Annex 1 to the Contract. The measurement protocols to be submitted for compliance verification are already included in the compliance verification under paragraph 3.5.1.

### 3.5.3 Luminous Flux Maintenance and Switching Endurance

The lamp shall meet the following requirements:

| 1. Luminous flux          | Luminous flux in relation to the declared <sup>6</sup> luminous flux |                          |
|---------------------------|--|--------------------------|
| at 0 h                    | Average of 20 lamps:   | ≥ 100 %                  |
|                           | Single value for each lamp:  | ≥ 90 %                   |
| after 2000 h              | Average of 20 lamps:   | ≥ 95 %                   |
|                           | Single value for at least 19 out of 20 lamps:                        | ≥ 90 %                   |
| 2. Switching endurance    | Single value for at least 19 out of 20 lamps:                        | ≥ 30000 switching cycles |
| 3. Premature failure rate |  | ≤ 5% after 1000 hours    |

#### Compliance Verification and Test Method

##### Measurement Method

The lamps shall be tested at three points in time (0 hours, after 1000 hours and after 2000 hours) as well as with a timer that cycles the lamps "ON" for 165 minutes and "OFF" for 15 minutes.

- ♦ **Luminous flux:**

The lamps shall be operated by a timer that cycles the lamps "ON" for 165 minutes and "OFF" for 15 minutes. The luminous flux shall be determined at two points in time – after 0<sup>5</sup> and after 2000 burning hours. The luminous flux shall be determined in accordance with DIN 5032-1 by integration of the light intensity distribution. The luminous flux measurement shall be made as follows:

- either on all test samples goniometrically in the far field according to DIN 5032 with an angular resolution of ≤ 5 ° in both space directions
- or
- according to DIN 5033 in an Ulbricht sphere and in relation to the exemplary goniometric measurement. This means that the test sample measured goniometrically by way of example at 0 hours [5] shall be used as luminous flux reference (sphere multiplier) for all subsequent measurements.

After 0 hours<sup>5</sup> the luminous flux of none of the 20 lamps may fall below 90 percent of the declared luminous flux; the mean value of the lamps must at last be equal to the declared luminous flux.

No more than 1 out of the 20 lamps may fall short of 90 percent of the declared luminous flux after 2000 burning hours; the mean value of the lamps must at last be 95% of the declared luminous flux.

- ♦ **Switching endurance:**

The lamps shall be operated by a timer that cycles the lamps "ON" for 1 minute and "OFF" for 3 minutes. A maximum of 1 out of 20 lamps may fail after 30000 switching cycles.

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<sup>6</sup> „Declared luminous flux“ means the luminous flux indicated on the packaging. In the case of non-directional lamps (Regulation 244/2009/EC) this is the overall luminous flux and in the case of directional lamps this is only the useful luminous flux according to Regulation 1194/2012/EU.



- ♦ **Premature failure rate:**

*The lamps shall be operated for 1000 hours by a timer that cycles the lamps "ON" for 165 minutes and "OFF" for 15 minutes in accordance with CIE 97:2005. No more than 1 out of 20 lamps may fail during this period of time.*

- **Documents to be submitted:**

*The applicant shall confirm compliance with the criterion in Annex 1 to the Contract. To verify compliance with these requirements the applicant shall submit the measurement protocols as Annex 7.*

### **3.6 UV Radiation**

Lamps to be Blue Angel eco-labelled must meet the following requirements:

- The lamp shall not emit any measurable UV radiation.
- In order to reduce the blue light hazard the lamps shall additionally be classified into risk group 0 („exempt group“), as defined in DIN EN 62471.

#### **Compliance Verification**

a) *If the application is filed for lamps that, owing to their design, do not produce any UV radiation compliance shall be verified by:*

- ♦ *presentation of the design schemes*
- ♦ *presentation of a spectrum for UVA (315 nm - 400 nm) plotted on a logarithmic and on a non-logarithmic scale.*

b) *If the application is filed for lamps that, owing to their design, do produce UV radiation the applicant shall make sure that the UV radiation specified remains below the detection limit. To prove compliance with the requirement the applicant shall present the following documents:*

- ♦ *survey spectrum of the source (plotted on a logarithmic and on a non-logarithmic scale)*
- ♦ *unweighted spectrum of the source for the range 250 nm - 400 nm (survey)*
- ♦ *spectrum of the source for the range 250 nm - 400 nm weighted by the  $SUV(\lambda)$  weighting function (plotted on a logarithmic and on a non-logarithmic scale)*
- ♦ *spectrum for the UVA range (315 nm - 400 nm).*

*The actinic UV and UVA shall be measured in accordance with DIN EN 62471. The suppression of scattered light of the measurement instrument used shall be at least  $10^{-6}$  for the range 250 nm to 315 nm and at least  $10^{-4}$  for the UVA range (315 nm to 400 nm). The applicant shall show by calculation that the actinic UV value is below the detection limit of the measurement instrument.*

*The applicant shall confirm compliance with the criterion in Annex 1 to the Contract, verify compliance with these requirements for a randomly selected lamp by means of measurements in accordance with DIN EN 62471 (Photobiological safety of lamps and lamp systems) and submit a corresponding test protocol as Annex 8 to establish compliance with the above-mentioned criteria.*

### **3.7 Electromagnetic Fields**

Lamps to be eco-labelled may emit electric fields at a distance of 30 cm only to an extent that the condition of  $F \leq 0.3 \%$  is met. F is the factor defined in equation E.2.4 of the assessment method to be applied for compliance verification.

#### **Compliance Verification**

*The applicant shall confirm compliance with the criterion in Annex 1 to the Contract, verify compliance with this requirement for a randomly selected lamp by measurement in accordance with EN 62493:2010 (Assessment of lighting equipment related to human exposure to electromagnetic fields) and submit a corresponding test protocol as Annex 9. The measured value shall fall short of the required value by 4dB. If the first measurement does not meet this criterion a second measurement shall be made which establishes compliance with this requirement.*

### **3.8 Flickering of Light Sources**

The amplitude of the luminous flux within the frequency range of up to 200 Hz must not exceed a modulation of 15 percent.

#### **Compliance Verification**

*Short-time measurements shall be performed on three lamps (out of the existing group of 20 lamps) in a frequency range of up to 200 Hz. In doing so, none of the lamps may have a modulation of over 15 percent calculated from the difference between the average luminous flux maxima and the average luminous flux minima, related to the average luminous flux – each during the measurement period. The applicant shall confirm compliance with the criterion in Annex 1 to the Contract and present a corresponding test protocol as Annex 10.*

### **3.9 Consumer Information**

#### **3.9.1 Lamp Parameters**

All lamp parameters for consumer information required under Regulations 244/2009/EC, 1194/2012/EU and 874/2012/EU shall be available on the packaging and on the Website. If the award for the Blue Angel requires the determination of lamp parameters by measurement, the consumer information and the measurement results shall be identical.

Colour rendering values shall not be listed as ranges of values but as exact-value numbers in the above-mentioned consumer information (packaging and Web).

#### **Compliance Verification**

*The applicant shall confirm compliance with the criterion in Annex 1 to the contract. To verify compliance with the requirements the applicant shall present both a sample packaging as Annex 11 and an image of the website concerned as Annex 12 and indicate its exact Uniform Resource Locator (URL) – (that is to say the Web address) in Annex 1 to the Contract.*

*In addition, the applicant shall indicate in Annex 1 to the Contract, whether or not the lamp is to be classified as a non-directional or a directional light source in accordance with the above-mentioned regulations.*

### **3.9.2 Disposal**

The German Elektro- und Elektronikgesetzes (ElektroG) (Electrical and Electronic Equipment Act) also requires mercury-free lamps to be separately disposed of and not to be disposed of as ordinary household waste. This requires the corresponding consumer information, including details on appropriate collection facilities.

#### **Compliance Verification**

*The applicant shall confirm compliance with the criterion in Annex 1 to the Contract. To verify compliance with the requirements the applicant shall present an image of the websites concerned as Annex 12 and indicate their exact Uniform Resource Locator (URL) – (that is to say the Web address) in Annex 1 to the Contract.*

## **4 Applicants and Parties Involved**

Manufacturers or distributors of final products according to Paragraph 2 shall be eligible for application.

Parties involved in the award process are:

- RAL gGmbH to award the Blue Angel Environmental Label,
- the federal state being home to the applicant's production site,
- Umweltbundesamt (German Environmental Agency) which after the signing of the contract receives all data and documents submitted in applications for the Blue Angel in order to be able to further develop the Basic Award Criteria.

## **5 Use of the Environmental Label**

The use of the Environmental Label by the applicant is governed by a contract on the use of the Environmental Label concluded with RAL gGmbH.

Within the scope of such contract, the applicant undertakes to comply with the requirements under Paragraph 3 while using the Environmental Label.

Contracts on the Use of the Environmental Label are concluded to fix the terms for the certification of products under Paragraph 2. Such contracts shall run until December 31, 2021. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2021 or March 31 of the respective year of extension.

After the expiry of the contract, the Environmental Label may neither be used for labelling nor for advertising purposes. This regulation shall not affect products being still in the market.

The applicant (manufacturer) shall be entitled to apply to RAL gGmbH for an extension of the right to use the ecolabel on the product entitled to the label if it is to be marketed under another brand/trade name and/or other marketing organisations.

The Contract on the Use of the Environmental Label shall specify:

- Applicant (manufacturer/distributor)
- Brand/trade name, product description
- Distributor (label user), i.e. the above-mentioned marketing organisations.

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