

# **BLUE ANGEL**

**The German Ecolabel**



**Stoves for wood**

**DE-UZ 212**

**Basic Award Criteria**

**Edition January 2020**

**Version 6**

**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 Background**

Even if it is carried out in a proper manner, heating with wood causes significantly more air pollutant emissions than other energy sources such as heating oil or natural gas. It can result, therefore, in higher levels of particulate matter and polycyclic aromatic hydrocarbon (PAHs) in the air in residential areas – especially if a lot of wood-burning stoves and fireplaces are operated at the same time in combination with weather conditions causing inversion.

The limits for particulate matter in ambient air that have been defined for the protection of human health can be significantly exceeded if emissions from the burning of wood are added to background levels or if special construction work is being completed.

In Germany, the PM<sub>10</sub> limits defined by the EU of 40 µg/m<sup>3</sup> for the annual mean value and 50 µg/m<sup>3</sup> for the 24-hour mean value (which must not be exceeded on more than 35 days a year) are valid. In order to adequately protect human health, however, the World Health Organisation (WHO) recommends much stricter limits (20 µg/m<sup>3</sup> for the annual mean value and 50 µg/m<sup>3</sup> for the 24-hour mean value, which must not be exceeded on more than three days). If these limits are used as a benchmark, four out of every five city dwellers on average breathe in more particulate matter than is considered healthy by the WHO according to the European Environment Agency. According to figures from the Federal Environmental Agency, the WHO guideline for the PM<sub>10</sub> daily limit was exceeded across Germany at 78% of all measurement stations in 2018.

The burning of wood primarily produces ultra-fine particles (smaller than 0.1 µm). Research into this subject has shown that these types of particles have a particularly negative impact on human health. A comprehensive network of measurement stations for these ultra-fine particles has not yet been established and no obligatory immission limits have been adopted. In addition, stoves produce black carbon (as a component of the particulate matter) and methane. Both these substances have a very high global warming potential.

Against this background, a reduction in emissions of particulate matter caused by, amongst other things, the operation of stoves is an important environmental goal.

### 1.3 Objectives of the Environmental Label

The primary objective of the Blue Angel for stoves is to improve air quality. Using an efficient and controlled combustion process and equipment to reduce the emissions, the aim is to significantly reduce particulate and other flue gas emissions in comparison to conventional stoves.

Stoves are mostly used as auxiliary heating systems in addition to central heating systems. User behaviour ranges from operation on a few cold days to daily operation throughout the entire heating season. In order to reduce emissions, the stoves should, therefore, have a minimum level of technical equipment that enables a low-emission combustion process that is largely unaffected by user behaviour.

By optimising the design of the stoves, manufacturers can help to minimise the impact caused by the use of these heating appliances and significantly reduce pollutant emissions.

Therefore, the environmental label will be awarded to stoves that stand out due to their observance of the following environmental criteria:

- Reduction in particulate matter
- User-friendliness

The environmental label may be awarded to stoves that use the fuel burned in them in an efficient manner and have significantly lower pollutant emissions. In addition to the statutory regulations for the type testing process for the stoves, the special requirements stipulated by the Blue Angel mean that stoves have to comply with significantly lower particulate and CO limit values and this must also be verified during the ignition phase that involves a particularly high level of emissions. In the case of organic gaseous carbon (OGC) and nitrogen oxides (NO<sub>x</sub>), emissions of these substances must already be below the limits defined in the EU Ecodesign requirements that will be generally applicable from January 2022.

When purchasing a new innovative stove, the environmental label will thus act as a decision-making aid for the reduction of air pollutants.

It is a voluntary label that is designed to motivate manufacturers to develop efficient and low-emission heating appliances. The label will allow manufacturers to highlight the environmental benefits offered by their heating appliance in a simple way.

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



## 1.4 Definitions

- **Stove:** A free-standing, single-room heating appliance with an enclosed firebox door according to EN 13240 or EN 16510 that is primarily used to heat the room in which it is installed.
- **Open flue stove (also called a conventional flue stove):** A single-room heating appliance that draws its combustion air from the room in which the stove has been installed.
- **Balanced flue stove:** A single-room heating appliance that does not draw its combustion air from the room in which the stove has been installed. The required combustion air is directly supplied from outside via pipes or ducts, whereby no dangerous quantities of the flue gas are able to escape into the room in which the stove has been installed. Therefore, it can be operated independently of the volume of air and ventilation in the room in which the stove has been installed.
- **Primary emission reduction technology:** Measure to prevent or reduce the generation of pollutants.
- **Secondary emission reduction technology:** Measure to reduce already generated pollutants.
- **Particulate matter:** Particulate matter consists of a complex mixture of solid and liquid particles and is divided into different fractions based on the size of the particles. A differentiation is made between PM10 and PM2.5 (PM, particulate matter) with a maximum size of 10 micrometres (10 µm) or a maximum size of 2.5 µm, as well as ultra-fine particles with a size of less than 0.1 µm.

## 2 Scope

These Basic Award Criteria apply to stoves for wood, which according to the operating instructions issued by the manufacturer are designed for natural wood (split logs), including any attached bark, compressed wood (such as briquettes, pellets) or for multiple types of these fuels. Stoves that are also designed by the manufacturer for use with coal are not covered by the scope of these Basic Award Criteria.

Alongside stoves with a primary emission reduction technology, the product definition also includes stoves that comply with the Basic Award Criteria in combination with an integrated or downstream secondary emission reduction technology.

## 3 Requirements

Stoves labelled with the Blue Angel must comply with at least the technical requirements listed in the following paragraphs:

### 3.1 Emission requirements

#### 3.1.1 Requirements for the stove

Stoves, where relevant in combination with an integrated or downstream particle separator, must comply with the maximum limits stated in Table 1, Column 3 for the particle content, carbon monoxide (CO), organic gaseous carbon (OGC) and nitrogen oxides (NO<sub>x</sub>). The test methods stated in Table 1 and the measurement specifications described in Appendix B must be used for this purpose. The limit values in Table 1 refer to dry flue gas, normalised to 0 °C, 1013 mbar and 13% oxygen by volume.

The particle count concentration must be determined (see Appendix C for the measurement method). In addition, the limit for the particle count concentration stated in Table 1, Column 3 must also be observed from 01/01/2024.

The requirements can be complied with in two ways:

a) Testing the overall system

The requirements will have been fulfilled if the mean values from the individual measurements described in Appendix B that were carried out on the tested stove, including all of the intended fixtures and attachments, do not exceed the relevant limits specified in Table 1, Column 3.

b) In combination with an efficient particle separator

- ◆ The requirements will have been fulfilled if the mean values from the individual measurements described in Appendix B that were carried out on the stove do not exceed the relevant limits specified in Table 1, Column 4 and the stove is sold and installed together with a particle separator. For particle separators, a minimum separating efficiency of 75% of the particle mass and (from 01/01/2024) 90% of the particle count must be verified. The limit value in Table 1, Column 3 must be complied with reliably when taking into account the separating efficiency.
- ◆ If a particle separator for which this minimum separating efficiency has been verified is already integrated into a chimney, the manufacturer can also sell the stove without the separator. The fact that the stove must be installed together with the associated particle separator that is integrated into the chimney must be indicated during the sale of the product and also in the installation instructions. The particle separator integrated into the chimney must already have been named and tested when submitting the application for the stove.

The measurement of the flue gas temperature, the flue gas sampling process and the measurement of the static pressure for the stove must be completed in a measurement circuit according to DIN EN 16510-1:2018-01 (D), Section A.2.3 as well as Diagrams 13 and 14 of this standard.

The measurement uncertainty stated in the test method is neither added nor subtracted.

Table 1: Emission limit values and test methods:

Parameter	Test method for the measurement specifications according to Appendix B	Limit value (1) for emissions	Limit value (1) for emissions from stoves before a downstream separator
Particle mass concentration	DIN EN 16510-1:2018 (2)	0.015 g/m <sup>3</sup>	0.040 g/m <sup>3</sup>
Particle count concentration	See Appendix C (Measurement obligatory from 01/01/2020)	From 01/01/2024: 5 x 10 <sup>6</sup> /cm <sup>3</sup>	No value
CO mass concentration	DIN EN 16510-1:2018 (2)	0.50 g/m <sup>3</sup>	0.50 g/m <sup>3</sup>
OGC mass concentration	DIN EN 16510-1:2018 (2)	0.07 gC/m <sup>3</sup>	0.07 gC/m <sup>3</sup>
NOx mass concentration	DIN EN 16510-1:2018 (2)	0.18 g/m <sup>3</sup>	0.18 g/m <sup>3</sup>
(1) Based on dry flue gas, normalised to 0 °C, 1013 mbar and 13% oxygen by volume.			
(2) Residential solid fuel burning appliances - Part 1: General requirements and test methods			

If the stove has multiple nominal loads (nominal heat outputs) or the manufacturer produces a family of identically designed stoves with different nominal loads, the highest and lowest nominal loads must be tested. If the measurements for only one of the tested loads comply with the limit values, the stove can only be sold with the Blue Angel for this nominal load (without the possibility of changing the load).

### 3.1.2 Requirements for the particle separator

If a combined system according to 3.1.1.b) is used, a minimum separating efficiency of 75% of the particle mass and (from 01/01/2024) 90% of the particle count must be verified for the particle separator. The efficiency of the particle separator is determined in accordance with DIN SPEC 33999 using the set up for stoves as an evaluated and mean corrected separating efficiency for the total particles and particle count.

The separating efficiency for the particle mass concentration is determined in accordance with DIN SPEC 33999 using the evaluation matrix from DIN SPEC 33999 described in Appendix C and with the exhaust dust status "1 - good" (raw gas dust content = 40-100 mg / m<sup>3</sup>) according to table 2.

The separating efficiency for the particle count concentration is also determined in accordance with DIN SPEC 33999 using the evaluation matrix from DIN SPEC 33999 described in Appendix C, as well as using the measuring instruments specified in Appendix C of these Basic Award Criteria.

The separating efficiency for the particle count concentration can also be determined by counting the particles alternately in series both before and after the separator.

Consideration of the calculated reduction achieved by using the particle separator is only permitted for the particle mass concentration and the particle count concentration. It can only be used if the stove and particle separator (in some cases an additional component) each have an operating hours counter.

**Compliance verification:**

*The applicant shall submit a test report as verification for the requirements according to 3.1, in which compliance with the requirements is documented for all of the fuels that the manufacturer indicates can be used in the stove. The test report must contain photographic documentation of the test and a copy of the operating instructions/quick user guide which were used for carrying out the test.*

*In the case of a downstream separator that can also be installed elsewhere, the applicant must submit an additional test report to confirm mechanical equality and the comparable switch-on behaviour. This means that the separator must not switch on with a delay compared to the test.*

*The test report must be completed by a testing laboratory that is accredited for the described tests on stoves according to EN 13240 or DIN EN 16510-1 pursuant to DIN EN ISO/IEC 17025 and is notified pursuant to the EU Construction Products Regulation 305/2011 (CPR). The testing institution shall submit a declaration according to Annex 2 that it did not participate in the development and optimisation of the stove.*

*The applicant shall publish the full test report on its website, state the corresponding Internet address in Annex 1 and declare that the test was carried out using the operating instructions/quick user guide that were specifically produced for this model of stove and are identical to the operating instructions included with the stoves offered for sale.*

*The testing institution does not need to be accredited for the measurement of the particle count concentration or the evaluation of the particle separator according to DIN SPEC 33999 because there is currently no accreditation available for single room heating systems for this testing standard.*

*For determining the efficiency of a particle separator according to DIN SPEC 33999, the testing institution can also use test reports for other suitable locations according to DIN SPEC 33999.*

*If a downstream particle separator is required to comply with the requirements, the applicant shall declare in Annex 3 that this is sold together with the stove. For stoves used in combination with systems integrated into the chimney, the applicant shall declare compliance with the requirements in Annex 3.*

**3.2 Combustion chamber**

If there are openings for combustion air in the combustion chamber wall, a notice must be attached to the combustion chamber when the stove is sold to warn the user not to block the combustion air opening with firewood. The manufacturer must also provide corresponding instructions in the quick user guide and operating instructions.

**Compliance verification:**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract.*

### 3.3 Tightness

Stoves holding the Blue Angel must comply with minimum requirements for their tightness, irrespective of the type of air supply (open flue or balanced flue). The test must be carried out after mechanical stress (opening and closing the doors) has been applied and after cooling of the stove following a thermal overload in accordance with the safety tests pursuant to DIN EN 16510-1:2018-11.

The mechanical stress involves opening and closing the firebox door 6000 times; all doors that do not need to be opened on a daily basis for the intended use of the stove, such as ash boxes, inspection or fuel storage doors, should be opened and closed 1000 times. The doors should be opened here to the widest possible angle.

The tightness should be measured at three different statistical overpressures of between 5 Pa and 15 Pa. For this purpose, the setting controls for the combustion air should remain closed; combustion air openings that cannot be closed should be sealed up.

A compensation curve should be formed using the measured values. The difference in the leakage rates on the compensation curves at a pressure of 10 Pa in each case must not exceed a value of 2.0 m<sup>3</sup>/h.

#### **Compliance verification:**

*The manufacturer shall submit a test report that documents the mechanical stress and the two leak tests and verifies compliance with the leakage rates.*

### 3.4 Air regulation

To ensure that the user has as little influence over the emissions as possible, it is not permitted for the air supply to be manually adjustable during intended operation. This is usually achieved through the automatic regulation of the air supply. As part of the type testing process for the stove, it must be certified that safe extraction of the flue gasses is guaranteed in an emergency. Verification is provided as part of the type testing process for approving the sale of the stove on the market.

If nominal and partial load operation is not recognized by the automatic stove control independently of the operator, the stove manufacturer must specify exact control modes (switch on the device, smartphone app or similar) for selecting nominal and partial load by the operator. A corresponding note as well as an exact specification of the wood support (wood mass, dimensions, billet geometry) for both operating modes must be included in the Quick User Guide and the operating instructions (with photos for clear illustration). It must be made clear to the operator that only these log wood properties defined in the accredited emissions test are permitted in the respective control modes and that different properties of the defined wood supports lead to non-compliance with the requirements of the Blue Angel.

#### **Compliance verification:**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract.*

### 3.5 Combustion monitor

A display must be provided for the user to indicate any deviation from the optimal operating state and to request that the user stokes the fire with wood.

**Compliance verification:**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract.*

**3.6 Emission reduction technology**

If an integrated or downstream secondary emission reduction technology is required (e.g. afterburner chamber, catalyst, separator), the manufacturer must indicate in the quick user guide and operating instructions the intervals at which cleaning and maintenance is required in order to guarantee proper operation.

If the downstream emission reduction technology belongs to the stove, the quick user guide must specifically indicate that the "Blue Angel" has only been awarded in this case for the combination of appliances and their combined operation.

The applicant must supply spare parts for this technology for at least 10 years after the end of production (e.g. catalyst).

For downstream catalysts used as a secondary emission reduction technology, it must be ensured in the real life installation that the downstream catalyst is not fitted at a greater distance from the stove connections than was the case in the tests carried out for these Basic Award Criteria so as to maintain the correct temperature.

In the case of electrically powered emission reduction technology, this must start automatically at the beginning of the fire insofar as this technology is not already permanently in operation. For emission reduction technology that requires a power supply to be effective, separate counters for the operating hours must be provided on both the stove and the emission reduction technology that record the actual operating times of the stove and the emission reduction technology.

**Compliance verification:**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract and describe the type of emission reduction technology used.*

**3.7 Rational use of energy**

The efficiency with respect to the utilisation of the fuel energy at nominal load (nominal heating output) and the "partial load" intended by the manufacturer (smallest output stated by the manufacturer) must be determined. The efficiency must not fall below 75% either at nominal load or "partial load".

**Compliance verification:**

*The efficiency shall be determined during the emission measurements in accordance with DIN EN 13240. The applicant shall submit the certificate for the type testing process that includes information on the efficiency level. The certificate must be issued by a testing laboratory that is accredited pursuant to DIN EN ISO/IEC 17025 and is notified pursuant to EU Construction Products Regulation 305/2011 System 3.*

## **3.8 Requirements for the preservation of resources and durability**

### **3.8.1 Repairability and provision of spare parts**

The stove must be designed so that it can be repaired by replacing individual parts that are no longer working. The applicant undertakes to guarantee the provision of spare parts for the repair of the appliances for at least 10 years following the termination of production.

Spare parts are those parts which, typically, may develop a fault within the scope of the ordinary use of a product. Whereas those parts which normally exceed the life of the product are not to be considered as spare parts.

The product documentation must include information about the repairability and the guaranteed supply of spare parts.

#### **Compliance verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract and submit the corresponding pages of the product documentation.*

### **3.8.2 Recyclable design**

In terms of the recyclable design of those appliances issued with the environmental label, the following is valid:

- ♦ The appliances must be designed in such a way that they can be dismantled and separated into recyclable materials by specialist companies using standard tools or that this process is simplified by intelligently designed connections.
- ♦ The appliances must be designed so that it is possible to separate metals into single materials and, where possible, recycle them separately.
- ♦ Specialist companies commissioned by the manufacturer for recycling the appliances must be provided with instructions on how to dismantle the appliances on the Internet.
- ♦ The strategy for the preferred reuse and recycling of the appliances that has been developed, including the points described above, must be published by the manufacturer on the Internet.

#### **Compliance verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract and enclose the information published about the recycling strategy in Annex 4.*

### **3.8.3 Maintenance and cleaning**

The operating instructions must include easily understandable instructions for the user/operator with respect to cleaning and removing ash from the firebox including, where relevant, any installed emission reduction equipment, as well as the recommended intervals, e.g. after a certain number of operating hours, to ensure the proper operation of the stove.

In order to prevent ash and particulate matter escaping from the heating appliance and, where relevant, any installed emission reduction technology, the stove manufacturer must define suitable measures and equipment for cleaning and removing the ash (permissible vacuum cleaner specifications, vacuum cleaner attachments and similar).

Components that are subject to wear must be listed in the operating instructions with the required replacement intervals. Wear parts must be made available to the user/operator for at least 10 years after the end of production (e.g. door handles, seals and parts that come into

contact with the flame/embers). If the wear parts can only be replaced by trained specialists, corresponding obligatory maintenance intervals must be prescribed by the manufacturer.

**Compliance verification:**

*The applicant shall declare compliance with the requirements in Annex 1 to the contract.*

**3.9 Material requirements for the packaging**

The plastics used for the packaging must be labelled in accordance with the currently valid version of the German Packaging Law (VerpackG). The obligation to register the packaging with the Central Office for the Packaging Register (Zentralen Stelle Verpackungsregister) must be observed.

**Compliance verification**

*The applicant shall declare compliance with the requirement and state the labelling for the packaging plastic in Annex 1 to the contract.*

**3.10 Consumer information**

All of the documents belonging to the appliance (except the Quick user guide) that are supplied in printed form with the appliance should be printed on recycled paper according to DE-UZ 14a that has been awarded the "Blue Angel" environmental label. In addition, the information must also be made available on the manufacturer's website on the Internet.

The target group for this information are laypeople who have no experience with stoves. Therefore, the customer must be provided with at least the following documentation when purchasing or taking delivery of the product, which refer to both the stove and any particle separator that may also be supplied with it:

1. Installation instructions
2. Commissioning instructions
3. Quick user guide
4. Operating instructions (detailed)

**3.10.1 Installation instructions**

The installation instructions must include easily understandable illustrations. If external components (such as e.g. a draught limiter or particle separator) are required for proper operation of the stove, this must be indicated in the instructions. The installation of the system must be carried out according to the manufacturer's instructions.

**3.10.2 Commissioning instructions**

The stove must be supplied with short, easily legible commissioning instructions that include pictograms. They must include instructions for approval and acceptance by the chimney sweep and instructions on the first heating up process for the stove. The commissioning instructions must also list all of the required additional components on the first page. Reference must also be made to the operating instructions.

These commissioning instructions must be attached to the appliance so that they can already be viewed by the user before making their decision to purchase the appliance and before the first heating up process (e.g. on the front, above the door opening).

### **3.10.3 Quick user guide**

In addition, another guide covering a maximum of two pages must be provided that includes the most important instructions for the fuel to be used (size of the pieces, dimension of wood, max. water content, quantity) for the ignition process, controlling the air flow, stoking the fire and cleaning/maintenance in a clearly visible and easy to understand form. This quick user guide must be permanently legible and abrasion-resistant and must not suffer from discolouration during normal use.

The instructions must include easy to understand illustrations and text that covers all of the operating steps required from the user during operation, in particular:

- ♦ Permissible fuels, quantities and dimensions of these fuels
- ♦ Intended layering of the fuel in the firebox
- ♦ Type and position of the firelighter
- ♦ Procedure for stoking the fire (adding fuel)
- ♦ Selection of control modes for nominal and partial load operation (if applicable)
- ♦ Procedure for ending the operation of the stove
- ♦ Instructions in the event of faulty operating states (e.g. escaping flue gas, failure of an electrical control system)
- ♦ If there are openings for combustion air in the combustion chamber wall, the manufacturer must include a corresponding notice in the quick user guide and operating instructions that these openings must not be blocked with firewood.

The instructions must leave as little room for interpretation as possible. Statements such as e.g. "depending on the desired output", "until a good flame has been achieved" or "depending on the quality of the fuel" must be avoided.

### **3.10.4 Operating instructions (detailed)**

The operating instructions provided to the customer when purchasing the product must contain at least the following information, which is presented in a clear and understandable way for the user:

- ♦ Instructions on approval and acceptance by the chimney sweep
- ♦ Instructions on the energy efficient use of the appliances
- ♦ Instructions on the fuel to be used (type, size of the pieces, dimension of wood, water content)
- ♦ Instructions on the low-emission operation of the stove
- ♦ Instructions on ignition and when to stoke the fire (including the quantities to be added)
- ♦ Instructions on exact control modes for nominal and partial load operation (with photos) including a defined wood description (if applicable)
- ♦ Instructions on cleaning the appliance, emission reduction equipment and the ash collection containers including the use of the required accessories
- ♦ Maintenance instructions for the appliance and the emission reduction system
- ♦ The possibilities for repairing the appliance in accordance with Paragraph 3.8.1
- ♦ Information on the recycling strategy in accordance with Paragraph 3.8.2

In addition, the above-mentioned information must be published on a freely accessible website that is linked via the manufacturer's website.

**Compliance verification:**

*The applicant shall declare compliance with the requirements 3.10.1 to 3.10.4 in Annex 1. The applicant shall state the Internet address for downloading the instructions in Annex 1 to the contract and enclose the required documents (installation instructions, commissioning instructions, quick user guide, operating instructions) and a photo of the stove.*

**3.11 Future revision of the environmental label**

In any future revision, the possibility of reducing the emission limits even further will be examined. This will take into account any technical advances and ensure that stoves labelled with the Blue Angel will also still have the lowest emissions in the future. In particular, the possibility of imposing a stricter OGC value will be examined.

In addition, the possibility of stipulating a higher level of efficiency while maintaining the strict emissions requirements should be examined.

The need to adapt the tightness requirements based on new findings about the pollution of indoor air by stoves will be examined.

Furthermore, the revision will examine whether the applicant can offer a 5-year guarantee for the secondary reduction technology if it is sold in combination with the stove.

To determine the particle count emissions from stoves, it has only been possible up to now to evaluate individual test results using the methods described in Appendix C. Round robin tests that could be used as the basis for defining a limit for the particle count emissions from the stove have not been available.

Nevertheless, the measurement of the particle count in accordance with the new methods is being introduced as an obligatory requirement. Due to the unavailability of round robin tests, it is necessary to allow a transition period for the introduction of the particle count limit. Compliance with the particle count limit will be obligatory for the award of the Blue Angel from 01/01/2024.

**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, 2024. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2024 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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## **Appendix A Cited legislation and standards, literature**

- DIN EN 16510-1:2018-11 Residential solid fuel burning appliances - Part 1: General requirements and test methods.
- DIN EN 13240:2005-10 Roomheaters fired by solid fuel - Requirements and test methods.
- DIN EN ISO/IEC 17025:2018-03 General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2017)
- DIN SPEC 33999:2014-12 Emission control - Small and medium-sized firing systems (according to 1st BImSchV) - Test method for the determination of the efficiency of downstream dust separators.
- First ordinance for implementing the Federal Immission Control Act (Ordinance for Small and medium-sized firing systems - 1st BImSchV): Ordinance for Small and medium-sized firing systems from 26 January 2010 (BGBl. I p. 38), last amended by Article 2 of the ordinance from 13 June 2019 (BGBl. I p. 804).
- Law for making products available on the market (Produktsicherheitsgesetz - ProdSG): Product Safety Act from 8 November 2011 (BGBl. I p. 2178, 2179; 2012 I p. 131), last amended by Article 435 of the ordinance from 31 August 2015 (BGBl. I p. 1474).
- EU Construction Products Regulation 305/2011: Regulation (EU) 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. Official Journal of the European Union, 4/4/2011; last amended by Commission Delegated Regulation (EU) No. 574/2014 of 21 February 2014. Official Journal of the European Union, 28/5/2014.
- EU Ecodesign Directive (2009/125/EC): Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. Official Journal of the European Union, 31/10/2009.
- EU Regulation No. 2015/1185 for solid fuel local space heaters: Commission Regulation (EU) No. 2015/1185 of 24 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel local space heaters. Official Journal of the European Union, 21/07/2015.
- EU Regulation No. 2015/1186 for energy labelling: Commission Delegated Regulation (EU) No. 2015/1186 of 24 April 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of local space heaters. Official Journal of the European Union, 21/07/2015.
- SR 941.242: VAMV – Ordinance of the Swiss Federal Department of Justice and Police (EPDJ) on flue gas measuring instruments for combustion motors from 19 March 2006
- Regulation (EU) No. 305/2011 (Construction Products Regulation): Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. Official Journal of the European Union, 04/04/2011.
- Packaging Law (VerpackG): Law for the sale, return and high-quality recycling of packaging from 5 July 2017 (BGBl. I p. 2234).

## Appendix B Measurement specifications for the particle-, CO-, OGC- and NOx-mass concentrations

The tests for the emission values are based on the type testing process according to DIN EN 13240 and DIN EN 16510 pursuant to Paragraph 3.1, Table 1. However, the use of the following measurement specifications includes other combustion phases and the scope of the measurements has been significantly expanded. Therefore, the testing requirements for the Blue Angel go beyond the specifications for the type testing process.

The following specifications from the manufacturer are required in order to use these measurement specifications:

- Settings for the nominal load and "partial load" (lowest output stated by the manufacturer) taking into account the limitations on user interventions (see the section "Settings on the stove" below)
- Maximum permissible draught (if stated in the operating instructions) or necessity to use a draught regulator
- Quantity of fuel at the nominal load and "partial load" including the type of fuel
- Method for adding and layering the fuel for ignition and stoking

The manufacturer's specifications are information contained in the operating instructions/quick user guide and the product information that the customer receives with the stove.

The operating instructions/quick user guide from the manufacturer that were used for completing the tests must be documented in the test report. These documents must be identical to the operating instructions/quick user guide that is supplied when the stove is sold.

Procedure	<p>Six particle measurements should be carried out; an average value should be calculated and evaluated for these six measurements.</p> <p>The six measurements should be carried out in three phases (seven combustion processes):</p> <p>1st measurement: <b>Ignition phase</b> (ignition and combustion, as well as an additional combustion process: gravimetric measurement of the particles),</p> <p>2nd - 4th measurements: <b>Nominal load phase</b> (three combustion processes: three gravimetric measurements of the particles)</p> <p>5th - 6th measurements: <b>"Partial load" phase</b> (two combustion processes: two gravimetric measurements). If the manufacturer of the stove has not stated the lowest output setting, the measurements should be carried out at the nominal load.</p> <p>The measurements of the gas emissions (CO, OGC, NOx) must be carried out continuously and uninterrupted from immediately at the point of ignition through to reaching the stoking criterion described below after the 7th combustion process:</p>
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	<p><b>“Ignition phase”</b> (two combustion processes): Ignition and one nominal load, starting with ignition at room temperature with natural draught, whereby the measurement of the particles must be carried out across the entire ignition operation (ignition combustion and first stoking of the fire). The particle measurement starts immediately after igniting the fuel and ends after reaching the point to stoke the fire for the second combustion process (after the last combustion process for the ignition phase).</p> <p><b>“Nominal load phase”</b> (combustion processes): Nominal load, whereby <b>three particle measurements</b> according to DIN EN 16510-1:2018-11 A.4.7 with a 12 Pa (tolerance +/- 2 Pa) chimney draught must be carried out immediately after one another directly following the ignition phase and then included in the evaluation. The particle measurements should be taken 3 minutes after stoking the fire and last for a period of 30 minutes.</p> <p><b>“Partial load phase”</b> (two combustion processes): Draught setting for the 5th measurement is achieved by transitioning from 12 Pa to the pressure defined for the “partial load” according to the manufacturer's specifications or, if this is not stated, with a 6 Pa (tolerance: +/-1 Pa) chimney draught (Diagram 2 of the standard) during the measurement period. “Partial load” is the lowest settable output according to the manufacturer's specifications. Carry out and evaluate <b>two particle measurements according to DIN EN 16510-1:2018-11 A.4.8</b> immediately after one another directly following nominal load operation.</p>
Measurement period	<p><b>Start</b> The measurement period starts immediately after igniting the fire (visible flames).</p> <p><b>Stoking the fire for the ignition phase (CO<sub>2</sub> or weight criterion):</b> The CO<sub>2</sub> or weight criterion should be used for stoking the fire in the ignition phase: The test period ends when the CO<sub>2</sub> concentration has fallen below 4% by volume (tolerance: +/- 0.5% by volume) or the weight criterion according to DIN EN 16510-1:2018 has been fulfilled.</p> <p><b>Stoking the fire in the nominal load and “partial load” phases (CO<sub>2</sub> or weight criterion):</b> Stoking the fire in the nominal load and “partial load” phases must be carried out in accordance with DIN EN 16510-1:2018-11 A.4.7 or DIN EN 16510-1:2018-01 A.4.8. This means that stoking of the fire for the nominal and “partial load” phases must be consistently carried out either according to the weight criterion or according to the CO<sub>2</sub> criterion described above.</p> <p><b>End of the measurement:</b> The measurement period ends when the selected stoking criterion for the 7th combustion process has been fulfilled.</p>

	The testing laboratory must provide details on the selected stoking criterion in the test report. The selected criterion must be used consistently for every single stoking process during the tests. Changing the criterion during the tests is not permitted.
Settings on the stove	The stove must be set in accordance with the manufacturer's specifications found in the operating instructions/quick user guide. After the ignition phase (ignition and the resulting combustion process directly afterwards = "ignition phase"), no other manual interventions in the stove are permitted. In the case of stoves with automatic combustion and output controls, the manufacturer's specifications for regulated operation described in the operating instructions/quick user guide should be taken into account.
Draught conditions	A real or simulated natural draught for the ignition phase with the following parameters must be used: <ul style="list-style-type: none"> <li>• Air temperature: 15 - 30 °C at the location defined in DIN EN 16510-1:2018</li> <li>• Height of the chimney: 4.00 m (+/- 10 cm)</li> <li>• The measurement circuit for the safety testing with natural feed pressure according to DIN 13240-2005-10 and DIN EN 16510-1, where necessary, with different measurement sockets should be used.</li> <li>• The draught measured in a cold state (feed pressure) must not exceed 2 Pa.</li> </ul>
Fuel	Beach wood logs according to the manufacturer's specifications should be used as fuel, although it is essential that they have the following characteristics: <ul style="list-style-type: none"> <li>• water content according to DIN EN 13240:2005-10 Table B.1: 16% (tolerance: +/- 4%)</li> <li>• or water content according to DIN EN 16510-1:2018-11 Table 18: 15% (tolerance: +/- 3%)</li> <li>•</li> </ul> A firelighter according to the manufacturer's specifications can be used as an ignition aid (e.g. wood wool soaked in paraffin). The use of damaged wood (e.g. with fungal infestation) is not permitted.
Quantity of fuel	Use the maximum values for the quantity of fuel, size of the pieces and dimensions of the wood, as well as the laying method for nominal load and "partial load", specified by the manufacturer.  For igniting the first combustion process, individual adjustments can be made with regard to size of pieces and dimension of the wood. In addition, smaller beech wood (kindling) with up to 25% of the fuel mass can be used. Corresponding information must be given in the Quick User Guide.
Measurement parameter	Measurement of the gaseous emissions must be carried out continuously from ignition through to the end of the 7th combustion process and across the three phases: <b>ignition phase, nominal load phase</b> and " <b>partial load</b> " <b>phase</b> . All seven combustion processes must be carried out

	<p>immediately after each other. For the six measurement periods to determine the total particles that are carried out immediately after one another (one measurement period for the ignition phase, five further measurement periods for the nominal load phase and "partial load" phase), an average value is firstly determined for each individual measurement period and then a total average value is determined for all of the measurement periods. The report must include both the individual values and also the total average value.</p> <p>For this continuous measurement method, data should be recorded at least every 15 seconds.</p>
Total particle mass	<p>Measurement of the "total particle mass" parameter should be carried out according to DIN EN 16510-1:2018-11 A 4.7 and Appendix F. Alternatively, other gravimetric measurement methods for this parameter that have been approved for the type testing process for stoves by notified testing institutions in Germany may be used.</p> <p>However, the following specifications, which may deviate from the standard, should be taken into account:</p> <p>The particle measurement starts in the ignition phase directly after igniting the fuel and ends after reaching the point to stoke the second combustion process (after the last combustion process for the ignition phase).</p> <p>In the nominal load and "partial load" phases, the particle measurement should start according to the specifications for the measurement method being used, while taking into account any other regulations that may be valid for the type testing process.</p>
CO	<p>DIN EN 16510-1:2018-11 A.7.3.1 and Appendix A.3</p> <p>Alternatively, other measurement methods for this parameter that have been approved for the type testing process for stoves by notified testing institutions in Germany may be used.</p>
OGC	<p>DIN EN 16510-1:2018-11 Appendix E and A.3</p> <p>Alternatively, other measurement methods for this parameter that have been approved for the type testing process for stoves by notified testing institutions in Germany may be used.</p>
NOx	<p>DIN EN 16510-1:2018-11 Appendix D and A.3</p> <p>Alternatively, other measurement methods for this parameter that have been approved for the type testing process for stoves by notified testing institutions in Germany may be used.</p>
Particle count	<p>See Appendix C of these Basic Award Criteria</p>
Temperature	<p>The measurement of the flue gas temperature must be completed in a measurement circuit according to DIN EN 16510-1:2018-11, Section A.2.3 as well as Diagrams 13 and 14 of this standard.</p>

	The temperature is measured at the measurement point in the measurement circuit. The temperature at the flue gas sockets on the stove is measured according to DIN EN 16510-1:2018-01, Section A.6.2.10.
Flue gas mass flow rate	The flue gas mass flow rate should be determined using calculations according to DIN EN 16510-1:2018-11, Section A.6.2.5.
CO <sub>2</sub> , O <sub>2</sub>	According to DIN EN 16510-1:2018-11, Appendix A.3 Alternatively, other measurement methods for this parameter that have been approved for the type testing process for stoves by notified testing institutions in Germany may be used.
Calculations	The calculations for the efficiency and heat output (total, room, water-heating output) of the three nominal load and two "partial load" combustion processes must be carried out in accordance with DIN EN 16510-1:2018-01, Section A.6.2.

## Appendix C Measurement specifications for the particle count

The measurement specifications are based on Swiss Ordinance SR 941.242 (measuring instruments for gas mixtures, measuring instruments for diesel smoke and measuring instruments for nanoparticles).

Manufacturer's specifications according to Annex XX are required in order to use these measurement specifications.

### 1. Basic principle

#### a. General

The measurement specifications have been defined for the counting of particles using a condensation particle counter (CPC) from a particle size of 23 nm and upwards. The process takes into account the solid particles that remain after using a volatile particle remover (e.g. thermodenuder).

Alternative measurement methods are permissible if their equivalence has been verified in comparative measurements carried out by the Leibniz Institute for Tropospheric Research (TROPOS) using the reference system defined by the DBFZ Leipzig. The systematic measurement error between a CPC-based reference system and another type of test equipment for the measurement of the particle count concentration from wood burners as part of the Blue Angel must not exceed a maximum of 20%. The sampling system including the dilution stage, the sampling lines and the measuring instrument are considered here as one unit.

The oxygen content of the flue gas is determined in parallel to the measurement of the particle count. Determining the oxygen content by measuring the carbon dioxide in the flue gas is permissible.

#### b. Process parameters

The following process parameters must be maintained during the measurement. The parameters must be evaluated on the basis of measurements on fire-burning stoves. All of the combustion phases as specified in Appendix B must be taken into account.

Measurement	Measured parameter	Maximum expanded uncertainty of the measuring instrument
Gas analysis	O <sub>2</sub>	+/- 5% of the measurement value or +/- 0.4% by volume (the higher value applies)
Particle count	Number (not based on 13% O <sub>2</sub> )	+/- 20% relative to the measurement value or 25,000 cm <sup>-3</sup> absolute

The reproducibility (between test facilities) of the measurements will be determined as part of round robin tests.

#### c. Sampling and sampling equipment

The samples should be taken at least 350 mm and a maximum of 1350 mm after the last measurement point of the measurement circuit that has been set up for the type testing process

in accordance with EN 16510-1:2018 (Diagram A.11 & A.12), regardless of integrated or downstream exhaust gas aftertreatment devices.

If the exhaust gas aftertreatment device is not integrated in the furnace, the minimum pipe length specified by the manufacturer after the separator must be taken into account. Sampling takes place in the middle of the free flow cross-section with a pipe of at least 10 mm diameter.

#### **d. Requirements for the appliances and gases**

The components specified by the manufacturer of the measuring instrument must be used. They must correspond to the components that were used for the comparative measurement and the round robin tests.

##### Sampling lines

The sampling equipment and sampling lines up to the dilution stage must be designed to prevent the condensation of water and volatile substances. This can be achieved e.g. by heating the sampling line or heating the dilution air. The sampling lines must be anti-static.

##### Pre-separator

An impactor or cyclone should be used to separate large particles. This equipment must have a cut-off of 50% at an aerodynamic particle diameter of 0.7 to 1.5  $\mu\text{m}$ .

##### Dilution

The sampled flue gas should be diluted in one or multiple dilution stages so that the particle count concentration can be measured within the calibrated range. For measurements on flue gas from stoves, this is generally achieved using a dilution of 1:500 or 1:1000. The measuring instrument must be designed for a lower response threshold of 10,000 particles per cubic centimetre and for a maximum particle concentration that is ten times the limit value.

##### Volatile particle remover

Volatile components (components capable of adsorption) should be removed from the sampled gas flow before the measurement. A volatile particle remover (e.g. a thermodenuder or catalytic stripper) should be used for this purpose. The temperature should be selected so that no elemental carbon forms from the hydrocarbons. This criterion is fulfilled if a separation efficiency of at least 90% is achieved for tetracontane aerosols.

##### Counting efficiency depending on the particle size

The counting efficiency corresponds to the specifications in the "International Recommendation Particulate Number Counter Draft 2019-05-23" from the Netherlands. The following instrument specifications must be maintained:

Maximum permissible errors (absolute or relative, the higher value applies)

Fault type	Maximum fault [Particle/cm <sup>3</sup> ]
Absolute	25 000
Relative	$\pm 25\%$ of the calculated value

##### Counting efficiency

Particle size [nm]	Efficiency
23 +/- 5%	0.2 – 0.6
50 +/- 5%	0.6 – 1.3
80 +/- 5%	0.7 – 1.3

## 2. Completing the measurements and calculating the measurement results

The measurements should be carried out according to the measurement method prescribed for gaseous pollutants in the criteria for the Blue Angel for stoves. The particle count is measured across the entire test cycle from the cold start through to the last measurement.

All particle count measurement values are recorded with a sampling rate of at least 0.1 Hz, averaged over the entire test cycle and then converted for an oxygen content of 13% by volume. For this purpose, the oxygen content in the flue gas measurement circuit and also across the entire test cycle should be measured; alternatively, it is permissible to measure the carbon dioxide content and use it to calculate the oxygen content.

In order to determine the measurement results, the values are converted for dry flue gas under normal conditions (273 K, 1013 hPa) and taking account of the selected dilution. The result is converted for an oxygen content in the flue gas of 13% by volume.

The measurement report must include the curve for the measured particle count over the entire test cycle without oxygen reference. In addition, the report must state the mean value for the particle count concentration over the entire testing cycle in  $\text{cm}^{-3}$ .

## 3. Calibration and testing

The measuring instrument must be regularly calibrated to national standards; the intervals are defined by the testing institution that uses the measuring instrument. This process must include at least a factory calibration.