BLUE ANGEL

The German Ecolabel

Particle separators for firewood single room heating appliances

DE-UZ 222

Basic Award Criteria

Edition January 2022

Version 3

The Environmental Label is supported by the following four institutions:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

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

Umwelt Bundesamt

The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labelling 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.

Jury Umweltzeichen

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.

RAL gGmbH

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, Nuclear Safety and Consumer Protection, 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 (PM) 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 during colder months in combination with weather conditions causing inversion or if the wood-burning stoves are located in valleys and basins.
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 PM10 limits defined by the EU of 40 µg/m^3 for the annual mean value and 50 µg/m^3 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 for PM10 (since 2021: 15 µg/m^3 for the annual mean value and 45 µg/m^3 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 breath 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 PM10 daily limit was exceeded across Germany at 33 % of all measurement stations in 2021. According to the WHO recommendation, the annual average value of 5 µg/m³ should not be exceeded for the more health-relevant particulate matter fraction PM2.5. This will not be met at 99 % of air quality stations in 2021. The daily average PM2.5 value of 15 µg/m³ recommended by the WHO is not met at any measuring station (Federal Environment Agency 2021)..
The burning of wood primarily produces in addition to the above-mentioned particulate matter fractions, PM10 and PM2.5, also ultra-fine particles (smaller than 0.1 µm). There are far less epidemiological (population-based) studies on these. According to current knowledge, it is nevertheless assumed 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 the emissions of particulate matter caused by, amongst other things, the operation of log firing systems is an important environmental goal. Particle separators can be fitted to wood-burning stoves to reduce the particulate matter produced during the burning of the wood and thus significantly decrease the amount of particulate matter that is particularly harmful to health. The Basic Award Criteria for the Blue Angel for Stoves for Wood (DE-UZ 212) already consider the use of particle separators in the certification of the overall system, however this only applies to new stoves.
Particle separators certified with the Blue Angel are primarily recommended for reducing particulate matter emissions from existing log firing systems. This additional equipment is not recommended for new stoves because stoves with an optimally matched particle separator that comply with the Blue Angel criteria are available instead.

1.3 Objectives of the Environmental Label

The primary objective of the Blue Angel for particle separators designed for manually fuelled log firing systems is to improve air quality by contributing to a reduction in the emissions of particulate matter.
Particle separators for manually fuelled log firing systems certified with the Blue Angel reduce particulate matter emissions to a much greater extent and more reliably than conventional particle separators (VDI 3670:2016).[1] In addition to the statutory regulations for building approval tests for particle separators, the special requirements imposed by the Blue Angel mean that certified particle separators have to comply with a significantly higher minimum separating efficiency and they must also be effective during the ignition phase that involves a particularly high level of emissions. The particle separators must have additional functions that e.g. display the operating hours and indicate whether maintenance is required. This ensures the proper functionality of the particle separator over a long period of time.
By optimising the design and guaranteeing the provision of spare parts in the long term, manufacturers of particle separators also help to improve the durability and reliability of the devices. As a result, particle separators certified with the Blue Angel can help to reduce pollutant emissions from manually fuelled log firing systems in the long term.
When purchasing particle separators, the environmental label will thus act as a decision-making aid for the reduction of air pollutants from log firing systems.
It is a voluntary label that is designed to motivate manufacturers of particle separators to develop efficient and durable devices. The label will allow manufacturers to highlight the environmental benefits offered by their particle separator in a simple way. Consumers therefore have the opportunity to choose an environmentally friendly product in a simple way.

[1] The VDI guideline specifies a minimum separation efficiency of 50 % for particle mass of 150-300 mg/Nm^3 and CO concentrations of 3000-8000 mg/Nm^3 according to the state of the art.

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

1.4 Definitions

Particle separator: A device to reduce particulate emissions, especially particulate matter, which is installed within or at the end of the flue pipe for a stove.

Manually fuelled log firing systems:

a) Free-standing, single-room heating systems with an enclosed firebox door according to DIN EN 13240 or DIN EN 16510-2-1 (so-called stoves),
b) Inset appliances according to EN DIN 13229 or DIN EN 16510-2-2,
c) Wood-burning cookers according to DIN EN 12815 or DIN EN 16510-2-3,
d) Slow heat release appliances according to DIN EN 15250 or DIN EN 16510-2-5, in which exclusively firewood or wood briquettes are burnt
e) Masonry stoves according to ZVSHK TROL

Particulate matter: A complex mixture of solid and liquid particles that is divided into different PM (particulate matter) fractions based on their aerodynamic diameter:

a) PM10: particulate matter that generally does not exceed a maximum diameter of 10 micrometers (10 µm),
b) PM2,5: particulate matter that generally does not exceed a maximum diameter of 2.5 µm,
c) Ultra-fine particles: particulate matter that generally has a diameter of less than 0.1 µm.[2]

Separating efficiency: The separating efficiency is the ratio of the separated particulate mass to the particulate mass in the raw gas ((raw gas concentration - clean gas concentration) / raw gas concentration), given in %.

Ignition phase: Ignition as a cold start and subsequent operation with one nominal load for a duration of at least 45 minutes, starting with ignition at room temperature (ignition combustion and first stoking of the fire).

Dust flocculation: agglomeration process of dust (including soot) particles enhanced by electrostatic precipitators.

2 Scope

These Basic Award Criteria apply to particle separators designed for the following manually fuelled log firing systems:

- Slow heat release appliances according to DIN EN 15250 or DIN EN 16510-2-5 with a thermal storage capacity of up to 260 MJ (e.g. 6 kW x 12 h)
- Masonry stoves according to ZVSHK TROL with a thermal storage capacity of up to 260 MJ (e.g. 6 kW x 12 h)

[2] The range measured in the measurement specification (Appendix B) covers particle sizes above 23 nm.

- Other stoves with a nominal heat output of up to 20 kW:
  - A free-standing, single-room heating appliance with an enclosed firebox door according to DIN EN 13240 or DIN EN 16510-2-1 (stoves)
  - Inset appliances according to DIN EN 13229 or DIN EN 16510-2-2
  - Wood-burning cookers according to DIN EN 12815 or DIN EN 16510-2-3

The label can be awarded to particle separators designed for all of the stated heating appliances except for stoves installed after 31 December 2021 because the environmental label DE-UZ 212 is already available for these stoves[3].
In order to achieve the required separating performance, a group of components consisting of a particle separator and other components designed to reduce emissions (e.g. a catalyst) is permissible.
According to the operating instructions issued by the manufacturer, the heating appliances must be approved for use with natural wood (split logs), including any attached bark, compressed wood (wooden briquettes) or multiple types of these fuels. For the installation of a particle separator, operating the stove with coal must be excluded by the manufacturer of the separator.

3 Requirements

3.1 Requirements for the separation of particulate matter

The particle separators must comply with the minimum values for the separating efficiency stated in Table 1. If the particle separator has different setting options (e.g. different voltages for electric separators), it must be tested under the most unfavourable conditions.

Tabelle 1: Minimum separating efficiency

Separating efficiency for the total particle mass	65%
Separating efficiency for the particle count	90%
Note: Due to the issue of dust flocculation it is necessary to measure the separating efficiency for the particle count and also the separating efficiency for the total particle mass. Measuring the separating efficiency for the total particle mass is designed to ensure that the separated particulate matter is retained and not emitted into the environment as flakes. A higher separating efficiency for the total particle mass will be required in future revisions of the Basic Award Criteria.	

It is also necessary to verify that the particle separator reduces emissions during a cold start of the heating appliance (during the **ignition phase**). Therefore, the ignition phase (including the cold start phase) must also be measured and evaluated in the tests.

The separating efficiency of the particle separator must be determined in accordance with DIN SPEC 33999 (2014) with the following additional requirements:

- The combustion processes measured in the test must take place directly after one another. It is not permitted to leave out some intermediate combustion processes from the evaluation unless the concentration in raw gas was not complied with.

[3] Heating appliances (stoves) with the environmental label DE-UZ 212 comply with additional requirements other than just a reduction in the particulate matter. This means that retrofitting a new stove with a particle separator is not considered to be equivalent to a new stove retrofitted with a particle separator that complies with the requirements for DE-UZ 222.

- The method for measuring particulate matter in VDI 2066-1 must be used for determining the separating efficiency for the total particle mass[4].
- To verify compliance with the Blue Angel criteria for particle separators, the measurements must be carried out using an average particle mass concentration in the raw gas, averaged over all combustion processes, of 100 – 200 mg/m³ under standard conditions (at 13 % O_2).
- It is not necessary to determine and/or deduct the blind separating efficiency of the measurement circuit.
- To determine the separating efficiency for the total particle mass, the separating efficiency for the particle mass must also be measured during cold start operation (X_{KS}), including the first two combustion processes, and integrated into the evaluation as a weighted value. The weighting is 1/3 for the additionally determined separating efficiency for the particle mass during a cold start (X_{KS}) and 2/3 for the separating efficiency for the particle mass under nominal load according to DIN SPEC 33999 (X_{NL}). The separating efficiency for the total particle mass $\bar{X}_{ges}$ is thus calculated as follows:

  $$\bar{X}_{ges} = \frac{(X_{KS} + 2 \cdot X_{NL})}{3}$$

  To determine the separating efficiency for the particle mass during a cold start (X_{KS}), the test stand for the particle separator must use test heating appliances according to DIN SPEC 33999 (2014) and, to determine the separating efficiency for the ignition phase, the total particle mass must be measured upstream and downstream of the particle separator in accordance with VDI 2066-1. The ignition phase includes the cold start and the first stoking of the fire (ignition and operation with one nominal load for a duration of at least 45 minutes). It is not necessary to comply with guidelines for the composition of the raw flue gas (especially the particle concentration) during the measurement of the ignition phase. The draught in the flue pipe from the test heating appliance must be maintained at a constant level of 12 Pa (tolerance +/- 2 Pa) during the entire ignition process. The mass flow rate of the flue gas that is channelled through the particle separator must reach the level for which the particle separator is designed under nominal load three minutes after igniting the wood for the cold start.
- The measurement of the total particle mass in the ignition phase 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).

As an alternative to the simultaneous measurement of the particle count upstream and downstream of the particle separator, it is also permitted to measure the particle count separately when the particle separator is switched off and when it is in operation. However, this requires two separate testing cycles, which must both be fully recorded and documented by the measurement technology.

[4] Or an equivalent measurement method for particulate matter. Verification of the equivalence of this method and its traceability back to the standard reference method for measuring particulate matter according to DIN EN-13284-1 must be provided. The equivalence must be verified in accordance with DIN EN 14793-5.

As an alternative to measuring the separating efficiency, the requirements are considered to have been complied with if a particle count of less than 3 x 10^6 cm^{-3} is measured on average over the whole measurement cycle downstream of the particle separator using the measurement setup described above.
The particle mass concentration in the raw gas must comply here with the range stated above.

Compliance verification

The applicant shall submit a test report as verification of compliance with the requirements in Paragraph 3.1, in which compliance with the requirements is documented.
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.
The test report must be completed by a testing laboratory that is accredited for tests on stoves according to DIN 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 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 particle separator and are identical to the operating instructions included with the particle separators offered for sale.

The testing institution shall submit a declaration according to Annex 2 that it did not participate in the development and optimisation of the particle separator.

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. The regulations of DIN EN ISO/IEC 17025 must be complied with. This includes the needs-based and regular calibration of the measuring devices and the participation of the testing laboratories in round robin tests.

All of the measured primary data from the emission tests must be saved by the label holder on a data medium for at least 10 years and handed over in full to the corresponding bodies (BMUV, UBA, RAL) on request. The applicant shall declare in Annex 1 that the primary measurement data have been saved to a data medium and can be made available for follow-up reviews.

3.2 Building regulation approvals

The particle separator or the group of components making up the particle separator must have been awarded a usability certificate from the building authorities for at least the intended area of application. In the technical description of the particle separator, the manufacturer must state the type of heating appliances for which the particle separator is approved.

Compliance verification

The applicant shall verify compliance with the requirements by submitting the usability certificate from the building authorities (Annex 3) and indicating the section of the technical description that states the area of application for the particle separator.

3.3 Installation requirements

The particle separator must be suitable for retrofitting onto existing log firing systems. It must be supplied with installation instructions that describe the place of installation. In accordance with the installation instructions, the particle separator may only be retrofitted to properly installed heating appliances. For this purpose, one of the following two requirements must be fulfilled:

- Type test: For the type of log firing systems, a measurement test must be carried out to verify that the particulate matter emissions do not exceed a maximum of 0.075 g/m^3 or
- Individual test: For individual heating appliances, a measurement test must be carried out to verify that the particulate matter emissions are lower than 0.15 g/m^3. To ensure a better combustion process, the carbon monoxide level must also be lower than 2.5 g/m^3. The measurement test must be carried out in accordance with Annex 4, Number 2 of the 1st BImSchV and must not be more than 3 years old at the time of application.

Compliance with the requirements must be tested by a chimney sweep when installing the particle separator.
If an upstream catalyst is required as a secondary emission reduction technology in order to achieve the separating performance, it must be ensured when installing the catalyst that it is not fitted further away from the heating appliance than was the case in the tests carried out for these Basic Award Criteria so as to maintain the correct temperature. This must be guaranteed by corresponding drawings and references in the installation instructions.

Compliance verification

The applicant shall verify compliance with the requirements by submitting the installation instructions and stating the prescribed installation location in Annex 1 to the contract.

3.4 Availability of the particle separator

In the case of particle separators that require an electrical power supply to function effectively, the separator must be equipped with technology that records the operating times of the particle separator and the heating appliance. The technology must also record any times during which malfunctions have occurred.
The availability of the particle separator should thus be displayed to users in an understandable ways (e.g. on a display or app).
The heating appliance is considered to have been switched on when the temperature in the flue pipe increases to at least 50°C. The heating appliance is considered to have been switched off when the temperature in the flue pipe falls below 150°C.
These functions must also be explained in the operating instructions.

Compliance verification

The applicant shall verify compliance with the requirements by submitting a declaration (Annex 4).

3.5 Behaviour in the event of a malfunction

In the event of malfunctions during the normal operation of the particle separator that persist and require a repair by customer services, an acoustic or optical warning must be sent to the installation location of the log burner after at least 10 minutes (it is also possible to send the warning electronically via an app with an acoustic signal).

Compliance verification

The applicant shall declare compliance with the requirement for an acoustic or optical warning in Annex 1 to the contract and also describe the type of warning issued in this annex.

3.6 Display of the maintenance cycle

After a period of time defined by the manufacturer, an acoustic or optical warning must be sent to the installation location of the log burner (it is also possible to send the warning electronically via an app with an acoustic signal) to indicate that maintenance or cleaning is required. It must be possible for the chimney sweep to set the maintenance cycle according to their specifications based on the expected number of operating hours per year.

Compliance verification

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

3.7 Cleaning

Cleaning of the particle separator must be carried out automatically, take place during normal sweeping or be easy for the user to complete without the need for any specialist knowledge. It must be possible to complete the cleaning process in a way that reduces the release of particulate matter to a minimum. Corresponding information on how to avoid any impact on the environment and health must be provided in the operating instructions (see Paragraph 3.10).

The separated particulate matter must be collected and disposed of properly. The operating instructions must indicate that it is not permitted to release the particulate matter into the environment. They must also indicate that the particulate matter must be disposed of properly and should not be used in the garden as fertiliser.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1 to the contract and state the section of the operating instructions that describes the cleaning process.

3.8 Requirements for the preservation of resources and durability

3.8.1 Repairability and provision of spare parts

The particle separator 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 devices (e.g. high-voltage insulators) for at least 10 years following the termination of production of the particle separator.

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 devices issued with the environmental label, the following is valid:

- The devices 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 devices 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 devices must be provided with instructions on how to dismantle the devices on the Internet.
- The strategy for the preferred reuse and recycling of the devices 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 5.

3.8.3 Maintenance and cleaning

The manufacturer must include easily understandable instructions for the user/operator with respect to cleaning and maintenance (e.g. removing ash) in both the quick user guide and the operating instructions. The manufacturer must state the recommended maintenance intervals (e.g. after a certain number of operating hours) in both documents in order to guarantee proper operation.
In order to prevent ash and particulate matter escaping from the particle separator, the 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. seals) of the separator. 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

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 device that are supplied in printed form with the device must 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 the operation of particle separators. Therefore, the customer must be provided with at least the following documentation when purchasing or taking delivery of the product:

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 are required for proper operation of the particle separator, this must be indicated in the instructions. The installation of the system must be carried out by specialist personnel in accordance with the manufacturer's instructions.

3.10.2 Commissioning instructions

The particle separator 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 operation of the particle separator. 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 device so that they can already be viewed by the user before starting the particle separator for the first time.

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 operation of the particle separator and the cleaning/maintenance of the particle filter in a clearly visible and easy to understand form. The instructions must include easy to understand illustrations and text that covers all of the operating steps required during operation, in particular:

- Permissible fuels
- Information on the permitted operating conditions, for which the particle separator was designed according to the manufacturer's specifications:
  - The minimum and maximum heating output for which the particle separator is designed
  - The minimum and maximum volumetric flow rate and mass flow of the flue gas at the inlet to the particle separator under the operating conditions for which the particle separator has been designed
  - The minimum and maximum temperature of the flue gas at the inlet to the particle separator
  - The minimum and maximum distance from the installation location to the flue connection piece on the stove
  - Maintenance and cleaning intervals e.g. after a certain number of operating hours- Instructions in the event of faulty operating states (e.g. failure of the automatic starting function, failure of the operating hours counter)

The instructions must leave as little room for interpretation as possible.

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 that are also given in the quick user guide
- Instructions on approval and acceptance by the chimney sweep
- Instructions to ensure a long service life of the devices
- Instructions on the type of fuel to be used
- Instructions on cleaning the device, including the use of the required accessories
- Instructions on maintaining the device
- 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. 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 particle separator.

3.11 Future revision of the environmental label

In any future revision, the possibility of imposing even stricter requirements for the separating efficiency will be examined. This will take into account any technical advances and ensure that particle separators for single-room, log firing systems that are labelled with the Blue Angel will also still have the highest separating efficiency in the future. The aim will be to achieve a separating efficiency for the total particle mass of 90%.
As soon as Basic Award Criteria for a Blue Angel for slow heat release appliances, wood-burning cookers and inset appliances have been published, the permission to retrofit particle separators certified with the Blue Angel onto newly installed heating appliances will be removed.
In the next revision, a review will be carried out to determine whether it would be sensible to define standard installation conditions for testing noise emission requirements and whether to formulate requirements for the measurement and disclosure of noise emissions. As DIN SPEC 33999 (2014) was being revised at the time these Basic Award Criteria were being drafted, the next revision will examine whether it is necessary to make reference to the updated version of the standard.
Expanding the scope and the corresponding requirements to cover pellet stoves will be examined during the next revision.

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, 2028.
They shall be extended by periods of one year each, unless terminated in writing by March 31, 2028 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.

Appendix A Cited legislations and standards, literature

Baumbach, G. 2013: Emissionen und Immissionen von Holzfeuerungen und Maßnahmen zu deren Minderung. Presentation. LAI-professional talk Wood Firing in Urban Areas at the LANUV NRW, Essen, 1./2. October 2013.

DE-UZ 14a Graphic paper and cardboard made from 100% recovered paper (recycled paper and cardboard), Blue Angel Basic Award Criteria, Edition January 2020, RAL gGmbH, Bonn.

DE-UZ 212 Stoves for Wood, Blue Angel Basic Award Criteria, Edition January 2020, RAL gGmbH, Bonn.
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, December 2014.

DIN EN 12815:2005-05 Residential cookers fired by solid fuel – Requirements and test methods; German version EN 12815:2001 + A1:2004, May 2005.

DIN EN 13240:2005-10 Roomheaters fired by solid fuel – Requirements and test methods; German version EN 13240:2001 + A2:2004, October 2005.

DIN EN 13284-1:2018-02 Stationary source emissions – Determination of low range mass concentration of dust – Part 1: Manual gravimetric method; German version EN 13284-1:2017.

DIN EN 14793:2017-05 Stationary source emissions – Demonstration of equivalence of an alternative method with a reference method; German version EN 14793:2017, May 2017.

DIN EN 15250:2007-06 Slow heat release appliances fired by solid fuel – Requirements and test methods; German version EN 15250:2007, June 2007.

DIN EN 16510-1:2023-02 Domestic solid fuel burning appliances - Part 1: General requirements and test methods, German version DIN EN 16510-1:2023, February 2023.

DIN EN 16510-2-1:2023-02 Residential solid fuel burning appliances – Part 2-1: Roomheaters, German version, EN 16510-2-1:2022, February 2023.

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Appendix B 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 1 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 on real exhaust gases from stoves using the defined reference system. 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 25 %. 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.
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.

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.

Measurement	Measured parameter	Maximum expanded uncertainty of the measuring instrument
Gas analysis	O_2	+/- 5% of the measurement value or +/- 0.4% by volume (the higher value applies)
Particle count	Number (not based on 13% O_2)	+/- 25% relative to the measurement value or (at less than 50 000 cm-3) 12 500 cm^{-3} 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 separation efficiency

measurement. 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. The sampling line should not be moved during sampling.

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 µm.

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^3]
Absolute	12 500 (at less than 50 000)
Relative	± 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 (UZ 212, Appendix B). The particle count is measured from the cold start phase (including the first two combustion processes) to the last measurement across the entire test cycle. The average value is calculated over the entire measurement cycle.

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 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.