

The new Blue Angel ecolabel certification method for firewood stoves

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Past, Present, Future

Are we close to the last possible turning point in climate change?

Current target: 1.5 degrees

Possible future in 30 years:
3 to 5 degrees
and the
consequences?

Source;
Prof. Dr. Ingo Hartmann



Hopefully soon
finally terminated!



Present of wood combustion



Why?

- **Renewable with potential for climate neutrality**
- **Heat supply and cosiness → high market potential**
- **Independent from energy import**
- **Secures the heat provision from local sources**
- **Residual wood use under criteria for biodiversity/sustainability**

Today:

- **(Still) Low technical degree**
- **Innovations and development needed**
- **Efficiency (Degree of heat utilization!) increase needed**
- **Potential for almost full abatement of pollutants and GHG emissions (e.g. soot)**

*Citation of Tool: „Descending“
Free fall through our midnight...
Falling isn't flying
Floating isn't infinite*

UNEP: Black Carbon



<https://ccacoalition.org/en>

<https://ccacoalition.org/en/slcsps/black-carbon>

- **“Black carbon has a warming impact on climate 460-1,500 times stronger than CO₂ per unit of mass”**
 - **“The average atmospheric lifetime of black carbon particles is 4-12 days”**
 - **“About 6.6 million tonnes of black carbon were emitted in 2015”**
 - **“Household cooking and heating account for 58% of global black carbon emissions”**
 - **“As the result of open biomass burning and residential solid fuel combustion, Asia, Africa and Latin America contribute approximately 88% of global black carbon emissions.”**
- BUT: If biomass combustion shall be GHG neutral also in developed countries, BC from all biomass furnaces must be mitigated to a large extent.**

Overview important points for Blue Angel



1. Significant reduction of emissions, also in the ignition phase

- Inclusion of the ignition phase in the emission test
- Compliance with significantly lower particle mass limits
- Added value: Reduction of the particle number (measurement obligation, target value)

2. Reduction of negative user influences

- No manual air control
- Improved operating instructions

3. Longevity

- Increased tightness requirements
- Long supply of spare parts (e.g. door seals)

Scope of application and holder of the sign



Scope of application:

- **Log wood stoves**
- **Coal/lignite use is not permitted**
- **Stoves can be offered with an associated external reduction technology**

Sign taker:

- **Manufacturer**
- **Distributor**

Emission limits



Emission requirements reached if the average of the individual measurements of the test cycles (ignition phase, nominal load, partial load - if provided by the manufacturer) does not exceed the limits

The specification of the unit is crucial with regard to decimal rounding and decimal capping. 1st BImSchV limit values are specified in g/m³. Therefore, these units were also used here.

Parameter	Test method For measuring regulation	Maximum value (1) Emission	Maximum value (1) Emission Stove with external precipitator
Particle mass concentration	DIN EN 16510-1:2018 (2)	0,015 g/m ³ (15 mg/m ³)	0,040 g/m ³ (40 mg/m ³)
Particle number concentration	See Annex C (Measurement is mandatory from 1.1.2020)	ab 1.1.2022: 5 x 10 ⁶ /cm ³	No specification
CO mass concentration	DIN EN 16510-1:2018 (2)	0,50 g/m ³ (500 mg/m ³)	0,50 g/m ³ (500 mg/m ³)
OGC mass concentration	DIN EN 16510-1:2018 (2)	0,07 gC/m ³ (70 mg/m ³)	0,07 gC/m ³ (70 mg/m ³)
NOx mass concentration	DIN EN 16510-1:2018 (2)	0,18 g/m ³ (180 mg/m ³)	0,18 g/m ³ (180 mg/m ³)

(1) Related to dry exhaust gas, standardized to 0 °C, 1013 mbar, 13 vol.-% oxygen

(2) Domestic solid fuel heaters - Part 1: General requirements and test methods

Extended test cycle compared to the type test



Continuous measurement over all 7 burn cycles:

From "cold start" to "residual coal bed weight"

- **Measurement of CO, CO₂, O₂, H₂O, Org.-C (VOC), total dust mass, particle number**
- **Ignition ("cold start" = first two burns) with natural draft**
- **Ignition, nominal load and partial load in one test cycle**
- **No selection of the best burns, all burns count and are averaged!**

Why natural draft?

- **Realistic behavior at ignition, e.g.: Can the stove be ignited during cold start without additional increased emissions?**

Why cold start?

- **Increased emissions due to "cold" combustion!**

Extended test cycle compared to the type test



Relevance of the ignition phase for emissions demonstrated

Kaminofen 1, Messtag 1					Kaminofen 1, Messtag 2				
Brennstoff- auflage	O ₂ Vol.-%	CO mg/m ³	Staub mg/m ³	OGC mg/m ³	Brennstoff- auflage	O ₂ Vol.-%	CO mg/m ³	Staub mg/m ³	OGC mg/m ³
1+2 (AZP)	13,3	2014	83	249	1+2 (AZP)	13,2	1753	61	156
3	9,0	711	23	46	3	12,1	1052	14	179
4	11,2	694	14	71	4	10,3	1027	25	170
5	11,6	894	14	100	5	9,4	465	41	28
6	10,8	1024	31	118	6	10,2	634	52	54
Mit AZP	11,2	1067	33	117	Mit AZP	11,0	986	39	118
Ohne AZP	10,8	878	23	90	Ohne AZP	10,6	833	34	110
Unterschied in %	-4	-22	-43	-29	Unterschied in %	-4	-18	-13	-7

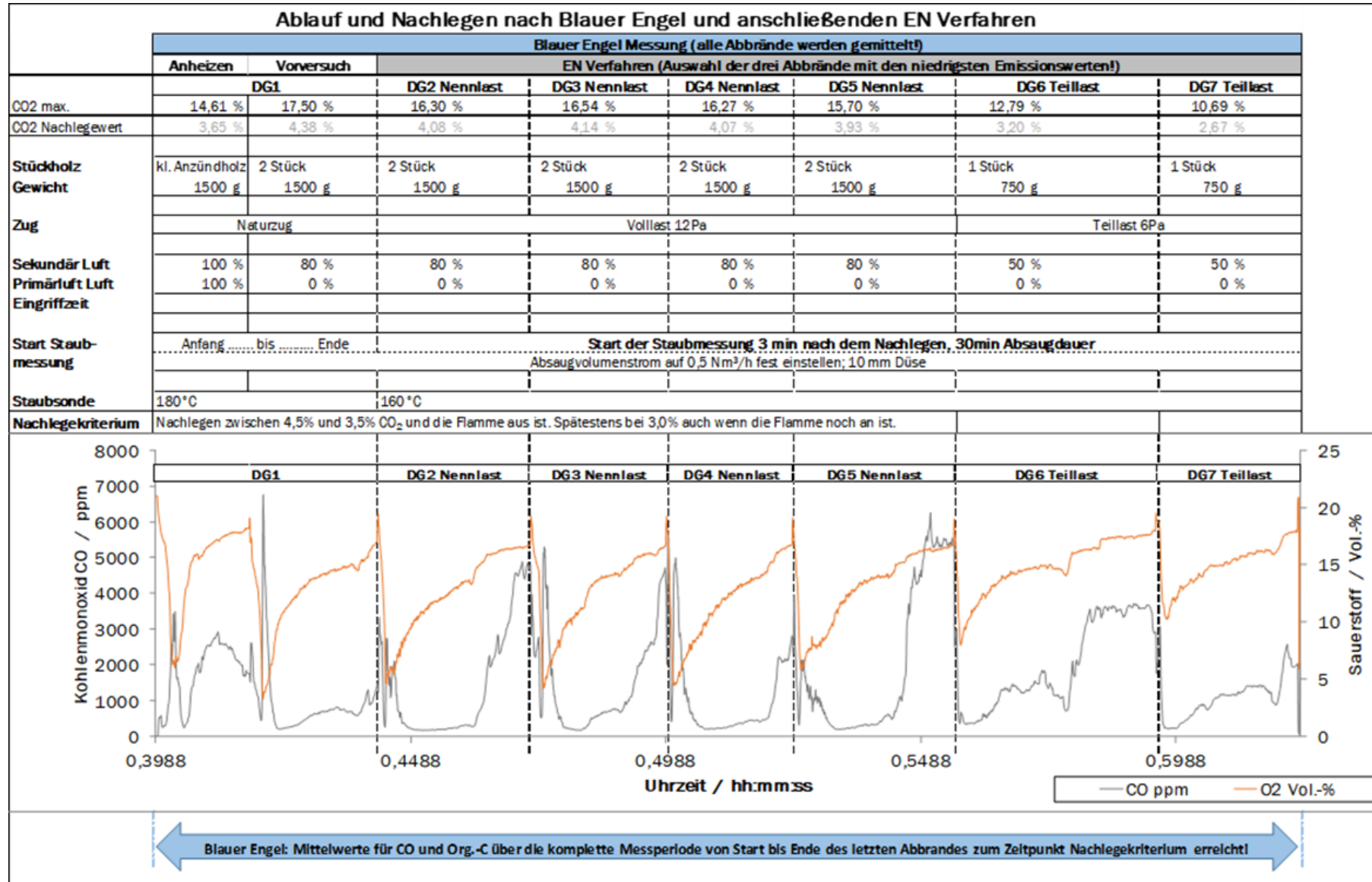
Kaminofen 2, Messtag 1					Kaminofen 2, Messtag 2				
Brennstoff- auflage	O ₂ Vol.-%	CO mg/m ³	Staub mg/m ³	OGC mg/m ³	Brennstoff- auflage	O ₂ Vol.-%	CO mg/m ³	Staub mg/m ³	OGC mg/m ³
1+2 (AZP)	15,2	1209	68	185	1+2 (AZP)	14,3	1232	60	95
3	13,4	1100	29	92	3	13,8	888	34	72
4	12,2	644	24	56	4	12,4	881	22	67
5	12,6	681	18	53	5	12,9	698	16	59
6	12,7	447	20	38	6	12,5	537	17	46
Mit AZP	13,2	816	32	85	Mit AZP	13,2	847	30	68
Ohne AZP	12,8	737	24	65	Ohne AZP	13,0	770	24	62
Unterschied in %	-3	-11	-30	-31	Unterschied in %	-2	-10	-25	-9

Data of two market available furnaces according to the state of the art without emission control technology, Blue Angel measuring procedure.

Source:

Statement of the DBFZ on the necessary requirement profile of a "Blue Angel for stoves" - Status: 25.02.2019

Extended test cycle compared to the type test



Planned emission requirement



Measurement of the particle number:

- **A new measurement standard (Appendix C) similar to the one used in motor vehicles, developed for the Blue Angel**

Limit value:

- **Comes into force only after Round Robin Test of the measurement method**
- **Objective of the Round Robin Test: Consolidation of the measurement specification.**

Measurement mandatory:

- **From validity of the basis for awarding the Blue Angel**

Objective of the measurement mandatory:

- **Consolidation of the planned maximum value**

Technical requirements



Combustion chamber:

- **Warnings against blocking of combustion air openings**
- **Information on this can also be found in the Quick User Guide and in the operating instructions.**

Tightness:

- **Leak test according to DIN EN 16510-1:2018-11**
- **after mechanical stress**
- **after thermal stress**

Air control:

- **In normal operation, no manual equipment for adjustment of the air supply is allowed**

Technical requirements

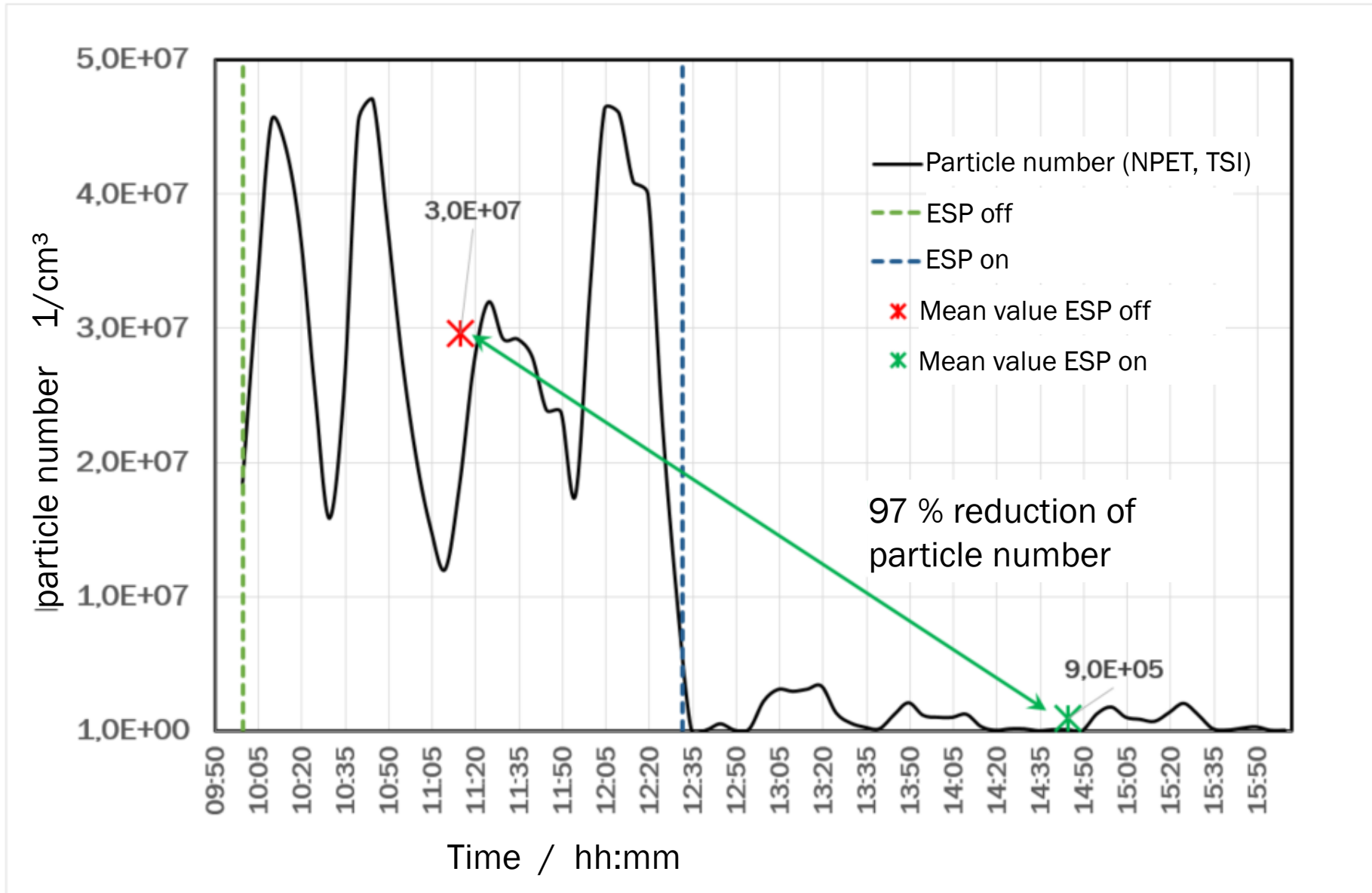


Emission abatement technology

(if an emission control technology is sold together with the stove):

- **Automatic start of the abatement technology when the stove is fired**
- **Operating hours counter (stove and emission abatement technology)**
- **10 years Provision of spare parts**
- **Notes on cleaning and maintenance in the Quick User Guide and in the operating instructions**
- **Installation of downstream catalytic converters not allowed at larger distance from the stove outlet (spigot) than during the test**

Example for number reduction by ESP



Measurement from
06.08.2019 at DBFZ

Consumer information



Printed documents should be produced on recycled paper that has been awarded the "Blue Angel" eco-label

The information is for non-experts who have no professional experience with stoves. Customers must therefore be provided with at least the following operating instructions or product information when purchasing the product:

- 1. Installation overview**
- 2. Quick User Guide**
- 3. Operating instructions**

Consumer information



1. Installation overview

- **The installation overview must be designed with easily understandable illustrations and serves as a guide for activities up to regular operation, which are usually carried out by the operator.**
- **The stove must be accompanied by instructions for the first heating of the stove, which must be no more than two pages long, clearly legible and provided with pictograms. On the first page, the instructions should also include all necessary additional components. Reference must be made to the operating instructions.**
- **This instruction must be attached to the appliance in such a way that it can be seen by the user before the decision to purchase and before the first ignition (e.g. at the front over the door opening).**

Consumer information



2. Quick User Guide

Instructions for the first firing

- **In addition, a further instruction manual, not exceeding two pages, must be enclosed, in which the most important information on the fuel to be used (size, max. water content, quantity) for ignition, air control, refilling and cleaning/maintenance is clearly recognizable and easily understood.**
- **This Quick User Guide must be permanently legible and abrasion-resistant and must not change color during normal use.**
- **The instructions must be designed with easily understandable illustrations and texts that cover all the steps to be carried out by the user during operation.**

Consumer information



2. Quick User Guide

Quick user guide must contain at least

- **Permissible fuel, fuel quantity and dimensions**
- **Intended stratification of the fuel in the combustion chamber and type and position of an ignition aid**
- **Air settings in cold start, at maximum permissible heat output, at minimum permissible heat output and when the furnace is not in operation**
- **Fuel recharging procedure**
- **Procedure for stopping the operation of the furnace**
- **Instructions for action at faulty operating conditions (e.g. flue gas outlet, failure of an electronic control system).**
- **The instructions must be given with as little room for interpretation as possible.**

Consumer information



3. Operating instructions

Easily understandable illustrations and texts, especially notes on

- **Energy-efficient use of the equipment**
- **Fuel to be used (type, size, water content)**
- **Low-emission operation of the furnace (including air adjustment)**
- **Ignition and time of refueling (incl. mass of refueling)**
- **Cleaning of the equipment, the emission control devices and the ash collection containers including the listing of the required accessories**
- **Maintenance of the equipment and emission control system**
- **Repair possibilities according to chapter 3.7.1**
- **Re-use and recycling strategy according to Chapter 3.7.3**

Summary



Background

- **Voluntary label for stoves**
- **Award for environmentally friendly stoves**
- **Option for suitable stoves in areas with high air pollution, alternative to wood stove bans**

Contributors

- **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety,**
- **Federal Environment Agency - UBA**
- **RAL non-profit GmbH**
- **Plant manufacturers**
- **DUH e.V. supported the development of an environmental label for wood-burning stoves**
- **Proposal developed by Ökopol and DBFZ, industry was involved/participated**

Current status: Published, in force, already two Blaue-Engel-stoves available.

Jury decided in December 2019 to evaluate also heating inserts and precipitators.

Smart Bioenergy – Innovationen für eine nachhaltige Zukunft

Kontakt

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Conclusion for 2050



Aim: Lowest emissions below oil and gas furnaces



More research and development needed

Advanced toxicology studies