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Revised and Updated Manual on Emission Monitoring at Installations which do not require Official Approval within the Scope of the 1st Federal Immission Control Ordinance (1st BImSchV)

Final Report

For our Environment

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Revised and Updated Manual on Emission Monitoring at Installations which do not require Official Approval within the Scope of the 1st Federal Immission Control Ordinance (1st BImSchV)

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Executive Summary

The present Manual summarizes the provisions, measurement procedures and legal framework of the 1st Federal Immission Control Ordinance (1st BImSchV – First Ordinance Implementing the Federal Immission Control Act – Small and Medium Firing Installations). Emphasis will be placed on the ordinance amended in 2010 and the changes with particular regard to single-room combustion installations and combustion installations fired by solid fuel. In addition to a description of measurement objectives, information on measurement technology is provided. Measurement principles are explained briefly.

This document also describes the emission measurement procedure as well as the involvement and responsibilities of the competent bodies. It also describes quality management measures and looks at the procedure of performance testing of measuring systems including performance criteria and test designs. The continuous monitoring of small combustion installations will also be dealt with.

A list of performance-tested measuring systems, for which performance or supplementary testing in accordance with the minimum requirements stipulated in VDI guideline 4206 has been carried out, is also included in this Manual.

Kurzbeschreibung

Im vorliegenden Leitfaden werden die Vorschriften, Messverfahren und gesetzlichen Rahmenbedingungen der 1. BImSchV (1. Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes – Verordnung über kleine und mittlere Feuerungsanlagen) zusammenfassend dargestellt. Schwerpunkte bilden die Neuerungen der im Jahr 2010 novellierten Verordnung und die Darstellung der Änderungen im Besonderen für Einzelraumfeuerungsanlagen und Feuerungsanlagen für feste Brennstoffe. Neben der Beschreibung der Messaufgaben wird zusätzlich auf die eingesetzte Messtechnik eingegangen. Die Messprinzipien werden kurz erläutert.

Darüber hinaus wird der Ablauf einer Emissionsmessung und die Einbindung und Verantwortlichkeit der zuständigen Stellen beschrieben. Die Maßnahmen zur Qualitätssicherung werden dargestellt und ein Einblick in das Verfahren der Eignungsprüfung von Messeinrichtungen mit den zugehörigen Mindestanforderungen und Prüfplänen gegeben. Auch die fortlaufende Überwachung der Kleinfeuerungsanlagen wird thematisiert.

Eine Zusammenstellung eignungsgeprüfter Messeinrichtungen, für die eine Eignungsprüfung oder Ergänzungsprüfung nach den Mindestanforderungen der VDI-Richtlinienreihe 4206 durchgeführt wurde, ist ebenfalls im Leitfaden vorhanden.

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TI Air	Technical Instructions on Air Quality Control [TA Luft] – First General Administrative Regulation Pertaining to the Federal Emission Control Act
BImSchG	Federal Immission Control Act
BImSchV	Federal Immission Control Ordinance
MW	Megawatt
ZIV	Federal Association of the Chimney Sweep Craft [Bundesverband des Schornsteinfegerhandwerks –Zentralinnungsverband ZIV]
BAnz.	Federal Gazette (in German: Bundesanzeiger)
BGBl.	Federal Law Gazette (in German: Bundesgesetzblatt)

Foreword

Given their large number small and medium combustion installations account for considerable emissions of air polluting substances. In order to reach the climate protection goals fixed by the Federal Government, heating systems and furnaces increasingly rely on renewable energy sources. Thus, wood as one example of a renewable energy source is a useful combustible to generate heat. At the same time, its incineration releases various air pollutants such as particulate matter and polycyclic aromatic hydrocarbons (PAHs). The use of renewable energy sources may hence not be detrimental to air quality.

Requirements for combustion installations using solid fuels, which date from 1988, have been substantially revised with the current version of the 1st Federal Immission Control Ordinance (1st BImSchV – First Ordinance Implementing the Federal Immission Control Act – Small and Medium Firing Installations) of 2010 and have thus been updated in light of recent technological developments.

This Manual, which is available in German and in English, discusses the legal and scientific background. In addition, measurement principles used for monitoring emissions in the cases of solid fuel combustion plants and those operating with oil or gas will be presented briefly. Non-discrimination of plant operators is crucial when it comes to emission monitoring. This requires quality assurance measures for performing measurements. These will also be described in detail in this Manual.

This Manual aims to inform interested experts in the field.

Dessau-Roßlau, April 2014

The Editor

1 Emission Monitoring

Plants which do not require official approval such as small and medium combustion installations represent an important source of emission of relevant air pollutants. These plants are numerous and may account for considerable air pollution locally and regionally. Small combustion installations are generally understood to be residential and commercial installations (crafts and commercial sector, agriculture, public sector bodies and military facilities) intended to provide space and process heat or hot water.

The increased use of solid fuels in small combustion installations have, in recent years, resulted in increased emissions notably of fine dust. The Federal Government's strategy to promote the use of biomass as fuel may not, however, be to the detriment of the environment or air quality. Accordingly, emissions resulting from the use of bio-fuels will have to be reduced in the long run. It is therefore indispensable to use modern small combustion installations which represent the state of the art.

The implementation of the 1st Federal Immission Control Ordinance (1st BImSchV) dated 26 January 2010 intends to make a contribution to this objective. While the previous version of this regulation stipulated a dust limit of 150 mg/m^3, the amended version envisages a restriction of this limit value for small combustion installations firing solid fuels to 20 mg/m^3 by 2015. The limit value is reduced in two stages. In order to give plant operators the time needed to modify plants where necessary, the regulation includes transitional provisions for existing installations.

It is not only plant technology which will have to be adapted to the requirements stipulated in the 1st BImSchV. In order to monitor adherence with the new limit values, the state of the art will also have to progress further. In particular, it has become necessary to develop new methods to monitor limit values for particulate matter. Consideration should also be given to the fact that measurement technology used for monitoring small combustion installations be relatively simple and adequate in light of minimizing the effort for monitoring. It is reasoned that plant operators should not incur unnecessarily high costs. Yet, measuring systems used by chimney sweeps for monitoring tasks shall satisfy a minimum standard in accordance with the 1st BImSchV in order to protect the plant operator from uncalled-for legal consequences and to ensure equal treatment.

The regulation provides that appropriate measuring systems be used. In other words, measuring systems undergo performance testing in the course of which they have to satisfy specific performance criteria in a given test procedure. These performance criteria were also revised as part of the amendment and communicated by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety by a circular dated 12 December 2011 and publicly notified in the Joint Ministerial Gazette (GMBl). They replace the previous performance criteria dating from 1997.

Measuring systems will undergo functional checks twice a year in order to ensure their quality after performance testing. Functional tests will be performed by test bodies which will be announced by the competent authority in accordance with state law. A test body, too, has to meet certain requirements. This will be verified regularly by an independent body.

In subsequent chapters of these guidelines, legal aspects already hinted at in this chapter and quality assurance measures for monitoring installations will be addressed in more detail. Applications, measurement principles and procedures for performance testing will be described in detail.

2 Legal Bases and Scope

National and International Law

Environmental law in Germany is governed by the Federal Immission Control Act (BImSchG – Bundes-Immissionsschutzgesetz) which entered into force in 1974. This act defines general requirements for the installation and operation of plants. Technical details and those relevant in practice are specified in individual executive orders. The act aims to protect humans and the environment from injurious pollution which may be caused by air pollution, noise or vibration.

Air pollutants cannot be contained in one location or region. This is why shortly after the introduction of the Federal Immission Control Act, attempts were made to replace single-state provisions by EU-wide standards.

In 1998, as part of the attempts to harmonise the legal framework Directive 96/62/EC on Ambient Air Quality Assessment and Management (Air Quality Framework Directive) was adopted. This forms the basis for all subsequent legal developments in the member states referring to air quality.

Finally, in 2008, Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ambient Air Quality Directive) entered into force and replaced the Air Quality Framework Directive and its daughter directives.

The transposal of the Ambient Air Quality Directive into German law stipulated, for the first time, air quality standards for particularly harmful particulate matter ($PM_{2,5}$) (39th BImSchV – Regulation on Air Quality Standards and Emission Limit Values). In 2010 already, a target value for $PM_{2,5}$ entered into force. As of 2015, this target value will become a binding limit value for $PM_{2.5}$. Existing air quality standards for particulate matter (PM_{10}), nitrogen oxides, benzene sulphur dioxide) remain unchanged.

In order to adhere to air quality standards, it will be necessary to further reduce emissions of these substances. The amendment of the 1st BImSchV intends to contribute to this objective. The amended regulation entered into force on 22 March 2010.

1st BImSchV

The 1st BImSchV regulates the installation, characteristics and operation of combustion installations which do not require official approval in accordance with the Federal Immission Control Act. This includes:

- combustion installations using wood and coal with heat capacities below 1 MW,
- combustion installations for straw, grain and similar vegetable fuels with a heat capacity below 0,1 MW,
- oil and fuel combustion installations with a heat capacity below 20 MW.

The regulation covers the area of small and medium combustion installations. Larger plants are within the scope of the 4th and 13th Federal Immission Control Ordinance (4th and 13th BImSchV). A brief overview of the various scopes is given in Table 1.

Table 1: Scope of the 1st BImSchV, 4th and 13th BImSchV

Capacity	Combustion installations burning solid fuels	Combustion installations burning oil and gas
≥ 4 kW < 1 MW	1st BImSchV	1st BImSchV
≥ 1 MW < 20 MW	4th BImSchV / TA Luft	1st BImSchV
≥ 20 MW < 50 MW	4th BImSchV / TA Luft	4th BImSchV / TA Luft
≥ 50 MW	13th BImSchV	13th BImSchV

The amendment of the 1st BImSchV notably required a revision of provisions governing solid fuel combustion installations. These dated from 1988 and were no longer suited for the state of the art given the progress in plant technology.

The objective to generate CO_2-neutral energy results in an increasing significance of wood combustion. Given the large number of such installations, they heavily contribute to air pollution caused by fine dust. In 2010, the share of small wood combustion installations in $PM_{2.5}$-emissions was 27 % [1]. In principle, CO_2-neutral energy production is seen favourably as it is a step towards reaching the climate protection target. However, reducing emissions of harmful air pollutants must be taken into account, too. The intended increase of biomass as an energy source of the future is thus only possible when used in connection with high-end plant technology which facilitates the reduction in emissions.

The current version of the 1st BImSchV aims to contribute to the reduction of dust emissions by defining more rigorous dust limit values. For solid fuels, limit values will be redefined gradually in two stages.

In addition, monitoring of solid fuel combustion installations will be strengthened considerably. For the first time, single room firing installations such as ovens and stoves will be monitored. These installations significantly contribute to the overall emissions of combustion installations covered by the 1st BImSchV: approximately 70 % of total solid fuel input is burned in about 14 million single room firing installations. Their share in overall emissions is equally large. 50 % of all single room firing installations have been in operation for more than 20 years and account for two thirds or the total particle load. More specifically, this concerns old fireplaces, tiled stoves and heating inserts whose combustion technology is sometimes inefficient. Monitoring single room firing installations is performed as part of a type test. Recurrent functional tests do not take place. Type tests are realized as bench test measurements by order of manufacturers of combustion installations. It is the operator's responsibility to present evidence of the type approval to the chimney sweep.

So far, only those combustion installations which are mechanically fed and have a heat capacity above 15 kW are subject to regular monitoring. The capacity limit for oil and gas combustion installations has up to now been set at 11 kW. Considering the reduced demand for heat in modern buildings, especially low-energy buildings, in which even today small installations provide sufficient heat, installations with a heat capacity of 4 kW and more now require regular monitoring.

Along with the changed capacity limit of 4 kW, the monitoring cycle for oil and gas combustion installations has also been modified. Monitoring used to take place once a year.

This period has been extended to at least two years now. Installations which have not been in operation for more than 12 years will have to be monitored every three years. Plants which have been in operation for more than 12 years will be monitored every other year. Installations which are fitted with an auto-calibrating, continuous control of the combustion process will be monitored once in five years. The extension of monitoring intervals has its justification in the emission behaviour of oil and gas heaters. First, their emission behaviour is stable over time and their impact on air quality especially with regard to fine dust is substantially lower than that of solid fuel combustion.

Secondly, however, nitrogen oxide (NO_x) emissions have to be reduced along with dust emissions in order to meet the limit values for NO_2. Therefore, stricter limit values for NO_x emissions of oil and gas combustion have been set in the 1st BImSchV. Compliance with the limit values is not, however, verified by regular functional tests by a chimney sweep. Rather, a type test as described above in more detail is performed.

By imposing a requirement for regular monitoring, the 1st BImSchV creates an incentive for regular service and maintenance of the combustion installations which ensures safe and low-emission operation of the installation. Monitoring the quality of the fuel imposed by the amended 1st BImSchV with regard to moisture in the case of solid fuel combustion has to be viewed in light of low-emission operation.

Monitoring measurements performed by the chimney sweep will have to take into account an element of proportionality. Measuring procedures used will be acceptably accurate and reasonably economical. Yet, in this instance too, comprehensive quality assurance must be guaranteed both with regard to the measurement technology proper and the performance of measurements since the operator may incur high costs in the event of non-compliance with the requirements of the 1st BImSchV. Here too, new measures of quality assurance were introduced, which are discussed in detail in chapter 6.

Amendments to the 1st BImSchV require adjustment with regard to the state of the art of measurement technology. The legal concept of “state of the art measurement technology” was introduced which allows the use of innovative measurement technologies without the need to amend the regulation accordingly. This flexible design applies to dust measurement in particular. Where previously a gravimetric measurement method had been imposed, the restriction no longer exists and other methods such as optical measurements may be applied.

A further improvement of the 1st BImSchV concerns consideration of measurement uncertainty when measuring flue gas loss, dust concentration and the carbon monoxide (CO) concentration. Since the operator of an installation is not responsible for the measurement uncertainty of a measurement method, the measured value is reduced by the measurement uncertainty in accordance with Annex 2, No. 2.3 of the 1st BImSchV.

2.1 Single-room firing installations

Single room firing installations are defined as combustion installations which are mainly used to heat the room in which they are installed. This includes cookers with and without indirectly heated baking facilities. For single room firing installations burning solid fuels, with the exception of basic furnaces and open fireplaces installed after 22 March 2010, a type test shall

provide evidence of the fact that the emission limit values listed in Table 2 are adhered to. A type test has to be performed for a single specimen of each model regardless of the number of installations sold. The test is performed by a notified body using a test bench. For further information, please see chapter 6.3.

Table 2: Emission limit values and minimum efficiency of single room firing installations burning solid fuels; performance criteria for type testing (Annex 4 of the 1st BImSchV)

		Stage 1: Installation on or after 22/03/2010		Stage 2 Installation after 31/12/2014		Installation on or after 22/03/2010
Type of fire place	Technical standards	Emission limit values		Emission limit values		Minimum efficiency in %
		CO in g/m³	Dust in g/m³	CO in g/m³	Dust in g/m³	
Room heaters with flat layer firing	DIN EN 13240 (Issued 09/2004) Intermittent operation	2,0	0,075	1,25	0,04	73
Room heaters with feeder firing	DIN EN 13240 (Issued 10/2005) Continuous operation	2,5	0,075	1,25	0,04	70
Heat storage stoves	DIN EN 15250/A1 (Issued 06/2007)	2,0	0,075	1,25	0,04	75
Fireplace inserts (closed operation)	DIN EN 13229 (Issued 10/2005)	2,0	0,075	1,25	0,04	75
Tiled stove inserts with flat-layer firing	DIN EN 13229/A1 (Issued 10/2005)	2,0	0,075	1,25	0,04	80
Tiled stove insert with feeder firing	DIN EN 13229/A1 (Issued 10/2005)	2,5	0,075	1,25	0,04	80
Cookers	DIN EN 12815 (Issued 09/2005)	3,0	0,075	1,50	0,04	70
Heating stoves	DIN EN 12815 (Issued 09/2005)	3,5	0,075	1,50	0,04	75
Pellet stoves without hot water heat exchanger	DIN EN 14785 (Issued 09/2006)	0,40	0,05	0,25	0,03	85
Pellet stoves with hot water heat exchanger	DIN EN 14785 (Issued 09/2006)	0,40	0,03	0,25	0,02	90

Single room firing installations not included in Table 2, which do not need to be grouped under the technical standards, shall comply with the following:

Table 3: Performance criteria for plants outside the scope of Table 2 (Annex 4 of the 1st BImSchV)

Field of Application	Requirements pursuant to
Small residential installations for heating	DIN EN 13240 (Edition 10/2005)
Small residential installations for cooking and baking or for cooking, baking and heating	DIN EN 12815 (Edition 09/2005)

Existing small residential installations firing solid fuels which were installed before 22 March 2010 may only continue to operate if they comply with the emission limits stated in Table 4.

Table 4: Limit values for existing single room firing installations (Art. 26 (1) of the 1st BImSchV)

Component	Emission limit value in g/m^3
Dust	0,15
Carbon monoxide	4

No limit values are defined for the operation of single room firing installation as reproducible results cannot be expected for monitoring such installations. For existing installation, evidence of compliance with the emission limit values listed in Table 4 may be provided either by means of a certificate of test bench measurement issued by the manufacturer or by a measurement performed on-site. The measurement is to be performed, considering the provisions applicable to test benches. There are, however, considerable differences between the actual determination of dust and CO concentrations performed by the chimney sweep and a measurement performed using a test bench. This concerns the use of different measuring procedures on the one hand and the duration of measurement which forms the basis of said measurement on the other. Thus, the CO concentration determined on a test bench - taking into consideration the relevant standards is the result of one combustion cycle while the measurement performed by the chimney sweep takes a mere 15 minutes. There are also differences with regard to the measurement of particulate matter. On the test bench, this is to be determined in accordance with the standard reference method defined in VDI 2066 part 1 or according to the DINplus certification scheme in conformity with the reference method or a comparable method. The duration of measurement is fixed at 30 minutes. The 1st BImSchV fixes the duration of the dust measurement performed on-site by the chimney sweep at 15 minutes. This is the sampling period for which the chimney sweep's measuring systems are performance tested. In order to account for these differences, provisions for the performance of emission measurements in the framework of a VDI guideline are currently being prepared.

Should installations not be able to comply with the required emission limit values, they shall be retrofitted with a filtering device or no longer be operated. The following time frame applies:

Table 5: Time frame for retrofitting or discontinuing operation of existing single room firing installations (Art. 26 (2) of the 1st BImSchV)

Date on the Type plate	Date of retrofitting or end of service
Until 31/12/1974 or not identifiable	31/12/2014
01/01/1975 – 31/12/1984	31/12/2017
01/01/1985 – 31/12/1994	31/12/2020
01/01/1995 – 21/03/2010	31/12/2024

The end of the transition period is determined by the date printed on the type plate. In case the date cannot be identified or identified clearly, additional information provided by the manufacturer may serve the purpose of clarification.

The following installations are exempt from this provision

- ovens and stoves which are not used for commercial purposes with a nominal heat output below 15 kilowatts,
- open fireplaces, i.e. fireplaces burning solid fuels, which may conventionally be operated openly unless fireplaces are intended for the sole purpose of preparing food
- basic furnaces, i.e. small residential installations used as heat storage stoves using mineral storage materials, which are put in place by a qualified technician,
- single room firing installations in dwellings whose heating is assured exclusively by said installations,
- single room firing installations for which the operator can convincingly argue to the district master chimney sweep that they were manufactured or installed before 1 January 1950.

Derogating from Table 5 the dates listed in, fireplace or tile stove inserts or similar stove inserts which are built in shall be fitted with a suitable downstream device for reducing dust emissions by 31 December 2013. Some manufacturers obtained certification on a voluntary basis before the amendment of the 1st BImSchV entered into force and are thus able to provide evidence of a low-pollutant combustion of solid fuels. This includes certification to DIN CERTCO, the environmental label Blue Angel (Blauer Engel) or RAL quality marks (e.g. by the quality associations “Tiled stove and industrially manufactured individual fireplaces“). These installations comply with the limit values of stage 1 and do not require further type testing.

In order to comply with the limit values for stage 2 as applicable after 1 January 2015 during type tests, further progress will be necessary with regard to combustion technology. Certain manufacturers of small residential installations already provide products at this stage which comply with the limit values applicable at stage 2. A long transition period is granted in order to provide for the reliable circumstances which manufacturers of small combustion installations require for the progress aimed at in plant technology.

It is estimated that 4.3 to 4.7 million single room firing installations of the overall 14 million currently installed in Germany will have to be retrofitted with filters or put out of operation. Downstream filtering devices for reducing dust emissions may only be used if they are found to be suitable by a competent authority or in case a type approval certificate exists. A confirmation of suitability or type approval is not required if compliance with the provisions governing air quality control is ensured by compliance with procedures applicable to design provisions on the use of products. This possibility will ensure that the state of the art of devices for reducing particle emissions such as particle separators or dust filters may be adapted flexibly to the state of the art.

2.2 Combustion installations fired by solid fuels

The regulation makes a difference between combustion installations firing solid fuels which are already in existence and new ones. Moreover, there are specific provisions for small residential installations which were addressed in more detail in chapter 2.1.

The previous version of the 1st BImSchV limited dust emissions of combustion plants firing solid fuels to 150 mg/m^3. The current version of the regulation provides two stages for the reduction of the limit values of dust and CO for new installations. These have been required since 22 March 2010 to meet the limit values of stage 1 listed in Table 6 already met by modern installations. The various limit values have been fixed taking into consideration the output of an installation and the fuel used. At stage 2, which will apply to all installation installed from 2015, a general limit value of 0.02 g/m^3 for dust will apply. Limit values for CO emissions will also be fixed at a single level with the exception of fuels consisting of various forms of treated wood. Monitoring these limit values will be performed by the chimney sweep.

Quality heating appliances are already able to meet the limit values of stage 1 today. Wood pellet heaters carrying the “Blue Angel” environmental label are well able to meet the limit value of 60 mg/m^3 or even fall below that value. Other fuels such as wood logs or wood chip may also be able to meet the limit values without the use of an additional particle separator such as filters.

In general, the requirements of stage 2 will not be easily met without additional technical progress. The transitional provisions provide manufacturers with a sufficient period for the required progress as well as the security needed for long-term planning. In some isolated cases, the limit value is already met. Frequently, pellet heaters carrying the “Blue Angel” environmental label already comply with the limit values. It is expected that installations burning wood logs and pellets will generally not require secondary measures such as filtering particle separators in order to meet the limit values.

For wood log and more especially for wood chip, additional effort to achieve progress will be required. For reasons of cost effectiveness, installations firing wood chip are situated in a higher range of nominal heat output. From today’s point of view, it seems likely that these installations will require filters or similar separators in order to comply with the limit values.

Table 6: Limit values for combustion installations firing solid fuels with a nominal heat output ≥ 4 kW according to the 1st BImSchV (Art. 5 (1))

	Fuel	Nominal heat output in kW	Emission limit value for dust in g/m³ related to 13 Vol.% O_2	Emission limit value CO in g/m³ related to 13 Vol.% O_2
Stage 1: Installations installed on or after 22 Mar 2010	hard coals, non-pitch bound hard-coal briquettes, hard coal coke, lignite, brown coal briquettes, brown coal coke, fuel peat, compacts made of fuel peat, grill charcoal, grill-charcoal briquettes in accordance with EN 1860, issued in September 2005	≥ 4 ≤ 500	0,09	1,0
		> 500	0,09	0,5
	untreated lumpy wood including adherent bark, especially as wood logs and wood chip as well as brush wood and cone, untreated non-coarse wood, especially as saw dust, chips and sanding dust as well as bark	≥ 4 ≤ 500	0,10	1,0
		> 500	0,10	0,5
	compacts made from untreated wood especially in the form of wood briquettes in accordance with DIN 51731, issued in October 1996, or as wood pellets in accordance with the fuel-related requirements of the DINplus-certification scheme "Wood pellets intended for small residential installations pursuant to DIN 51731-HP 5", issued in August 2007, as well as other wood briquettes or wood pellets from untreated wood meeting similar quality standards	≥ 4 ≤ 500	0,06	0,8
		> 500	0,06	0,5
	painted, lacquered or coated wood as well as resulting waste products, in so far as no wood preservatives have been applied or remain as a result of any treatment and in as far as coatings do not contain organ-halogen compounds or heavy metals, plywood, chipboard, fibreboards or other laminated wood as well as resulting waste products in as far as no wood preservatives are applied or contained as a result of any treatment and in as far as coatings do not contain organohalogen compounds or heavy metals	≥ 30 ≤ 100	0,10	0,8
		> 100 ≤ 500	0,10	0,5
		> 500	0,10	0,3
	straw and similar organic matter, non-food grains such as grain kernel, chaff kernels, the entire cereal plant, chaff, chaff residual as well as pellets made from the fuels listed above, other regenerative materials in as much as they meet the requirements of Art. 3 (5) of the 1st BImSchV	≥ 4 < 100	0,10	1,0
Stage 2: Installations installed after 31 Dec 2014	hard coal, non-pitch bound hard-coal briquettes, hard coal coke, lignite, brown coal briquettes, brown coal coke, fuel peat, compacts made of fuel peat, grill charcoal, grill-charcoal briquettes in accordance with EN 1860, issued in September 2005, untreated lumpy wood including adherent bark, especially as wood logs and wood chip as well as brush wood and cone, untreated non-coarse wood, especially as saw dust, chips and sanding dust as well as bark; Compacts made from untreated wood especially in the form of wood briquettes in accordance with DIN 51731, issued in October 1996, or as wood pellets in accordance with the fuel-related requirements of the DINplus-certification scheme "Wood pellets intended for small residential installations pursuant to DIN 51731-HP 5", issued in August 2007, as well as other wood briquettes or wood pellets from untreated wood meeting similar quality standards[1)]	≥ 4	0,02	0,4

	Fuel	Nominal heat output in kW	Emission limit value for dust in g/m³ related to 13 Vol.% O_2	Emission limit value CO in g/m³ related to 13 Vol.% O_2
	painted, lacquered or coated wood as well as resulting waste products, in so far as no wood preservatives have been applied or remain as a result of any treatment and in as far as coatings do not contain organ-halogen compounds or heavy metals, plywood, chipboard, fibreboards or other laminated wood as well as resulting waste products in as far as no wood preservatives are applied or contained as a result of any treatment and in as far as coatings do not contain organohalogen compounds or heavy metals.	≥ 30 ≤ 500	0,02	0,4
		> 500	0,02	0,3
	straw and similar organic matter, non-food grains such as grain kernel, chaff kernels, the entire cereal plant, chaff, chaff residual as well as pellets made from the fuels listed above, other regenerative materials in as much as they meet the requirements of Art. 3 (5) of the 1st BImSchV	≥ 4 < 100	0,02	0,4

1) Combustion installations which are exclusively fired with untreated lumpy wood including adherent bark in the form of wood logs will have to comply with the stage 2 limit values for plants installed after 31 December 2016.

Existing combustion installations firing solid fuels with a nominal heat output > 15 kW shall also meet the stage 1 limit values after a transition period which is determined in accordance with the respective date of installation. The transition time provided is based on an assumed operating time of 20 years which corresponds to the average life span of a combustion installation. This aims to ensure that the operator will not incur excessive costs as only those installations will have to be replaced which have already reached the end of their life span. Newer, low-emission installations which were installed after 1 January 1995 and before the entry into force of the 1st BImSchV will generally already meet the limit values of the first stage.

Table 7 presents transition periods for existing installations.

Table 7: Transition periods for compliance with the limit values of stage 1 (Art. 25 (1) of the 1st BImSchV)

1 Jan 2015	1 Jan 1995 – 31 Dec 2004 Jan 2019
1 Jan 2005 – 21 Mar 2010	01/01/2015
01/01/1995 – 31/12/2004	01/01/2019
01/01/2005 – 21/03/2010	01/01/2025

Since 22 March 2010 until the applicable dates listed in Table 7, existing combustion installations with a nominal output > 15 kW shall meet the requirements for limit values presented in Table 8.

Table 8: Emission limit values applicable to existing combustion installations until the end of the transition period (Art. 25 (2) of the 1st BImSchV)

Fuel	Nominal heat output in kW	Emission limit value for dust in g/m³	Emission limit value for CO in g/m³	Oxygen reference value in Vol.%
hard coals, non-pitch bound hard-coal briquettes, hard coal coke, lignite, brown coal briquettes, brown coal coke, fuel peat, compacts made of fuel peat, grill charcoal, grill-charcoal briquettes in accordance with EN 1860, issued in September 2005	> 15	0,15	-	8
untreated lumpy wood including adherent bark, especially as wood logs and wood chip as well as brush wood and cone, untreated non-coarse wood, especially as saw dust, chips and sanding dust as well as bark; Compacts made from untreated wood especially in the form of wood briquettes in accordance with DIN 51731, issued in October 1996, or as wood pellets in accordance with the fuel-related requirements of the DINplus-certification scheme "Wood pellets intended for small residential installations pursuant to DIN 51731-HP 5", issued in August 2007, as well as other wood briquettes or wood pellets from untreated	> 15 ≤ 50	0,15	4	13
	> 50 ≤ 150	0,15	2	13
	> 150 ≤ 500	0,15	1	13
	> 500	0,15	0,5	13

Fuel	Nominal heat output in kW	Emission limit value for dust in g/m³	Emission limit value for CO in g/m³	Oxygen reference value in Vol.%
wood meeting similar quality standards	> 500	0,15	0,5	13
painted, lacquered or coated wood as well as resulting waste products, in so far as no wood preservatives have been applied or remain as a result of any treatment and in as far as coatings do not contain organ-halogen compounds or heavy metals, plywood, chipboard, fibreboards or other laminated wood as well as resulting waste products in as far as no wood preservatives are applied or contained as a result of any treatment and in as far as coatings do not contain organohalogen compounds or heavy metals	≥ 50 ≤ 100	0,15	0,8	13
	> 100 ≤ 500	0,15	0,5	13
	> 500	0,15	0,3	13
straw and similar organic matter, non-food grains such as grain kernel, chaff kernels, the entire cereal plant, chaff, chaff residual as well as pellets made from the fuels listed above, other regenerative materials in as much as they meet the requirements of Art. 3 (5) of the 1st BImSchV	≥ 15 < 100	0,15	4	13

New installations burning straw and similar organic matter, non-food grains such as grain kernel, chaff kernels, the entire cereal plant, chaff, chaff residual as well as pellets made from the fuels listed above (Art. 3 (1) No. 8 of the 1st BImSchV) shall undergo type testing in addition to measurements carried out by the chimney sweep. The same applies to installations intended to use other regenerative resources as fuel (Art. 3 (1) No. 13 of the 1st BImSchV).

On the test bench, the limit values listed in Table 9 apply to both categories of fuel.

Table 9: Type test requirements for installations firing fuels pursuant to Art. 3 (1) No. 8 and 13 of the 1st BImSchV (Annex 4 (2) of the 1st BImSchV)

Component		Emission limit value
Dioxins and furans (PCDD/PCDF)		0.1 mg/m³
Nitrogen oxides	Installations installed on or after 22 Mar 2010	Nitrogen oxides
	Installations installed after 31 Dec 2014	
Carbon monoxide		0.25 g/m³

Straw and similar plant matter had already been approved as regular fuels by the previous version of the 1st BImSchV. The fuels pursuant to no. 8 mentioned above were added to this category. This aims to enable businesses cultivating or processing cereals such as agriculture, horticulture and forestry businesses and the agribusiness industry (i.e. mills and agricultural trade businesses) to make use of the newly-added fuels (with the exception of straw and similar plant matter). Equally, a category of fuels called other regenerative resources have been incorporated into the 1st BImSchV.

The use of fuels pursuant to no. 8 and the use of fuels under no. 13 are both intended for automatically fed installations. The exact composition of the fuel highly depends on its production process and its origin and may thus vary greatly.

Firing these fuels is expected to lead to higher emissions of air pollutants than firing wood. This is particularly the case for the emission of nitrogen oxides, hydrogen chloride and particulate matter but also for highly critical pollutants such as dioxins and furans. These differences mainly result from variations in the content of substances relevant to emissions such as nitrogen and chlorine.

For this reason, additional emission limit values have been defined and have to be met in type tests. Given the high potential of these fuels for forming hazardous substances, measurements in light of health and environmental protection are both recommended and necessary. Moreover, straw, cereal-like fuels and other regenerative resources may only be fired in installations with an automatic feeding system as this allows for constant fuel supply. This may help to reduce emissions.

Other regenerative resources constitute a category of fuels which make up a broad range of possible materials. The 1st BImSchV stipulates additional requirements for these fuels. Thus, they shall comply with standardised quality requirements. The affected installations shall furthermore undergo a test programme once a year. This includes, among other aspects, verifying compliance with the limit values for dioxins and furans in practice during operation of the installation.

Regulations, which will take the form of interpretative questions, for the fuel categories under no. 8 and 13 are being developed. Provisions stipulated in the ordinance are being concretised. Test bench measurements are an emphasis for both categories of fuels. Furthermore, the performance of the annual measurement programme for other regenerative resources is described in detail; the 1st BImSchV does not stipulate specific requirements such as the number of required measurements. After agreement by the Working Group of the Federal States for Immission Control (“Bund-/Länderarbeitsgemeinschaft für Immissionsschutz (LAI)”), the interpretative questions aim to provide recommendations for action serving as a guide for performance.

2.3 Combustion installations fired by oil

A distinction has to be made for combustion installations fired by light fuel oil (fuel oil EL) in accordance with standard DIN 51603-1 issued August 2008, and other fuel oils of equal quality as well as methanol, ethanol, untreated vegetable oil and vegetable oil methyl esters (combustion installations fired by oil) between installations with a thermal fixing capacity < 10 MW and those with a thermal fixing capacity of ≥ 10 MW < 20 MW.

For small combustion installations < 10 MW a further distinction is made between installations with an atomizing oil burner and those with a vaporization burner. The respective emission limit values are listed in Table 10 and Table 11. In any case, waste gas may not contain oil derivatives, which would be an indicator of adverse combustion conditions.

Table 10: Emission limits for oil combustion installations with vaporisation burner (Art. 7 and 10 (1) of the 1st BImSchV)

Nominal heat output in kW	Smoke Number	Carbon monoxide in mg/kWh	Waste gas heat loss
≥ 4 ≤ 25 [1) 2)]	2 / 3 [3)]	1300	11
> 25 ≤ 50 [2)]	2	1300	10
> 50	2	1300	9

1) with the exception of small residential installations with a nominal heat output ≤ 11 kW

2) with the exception of combustion installations a nominal heat output ≤ 28 kW for the sole purpose of industrial water heating

3) for installations with a nominal heat output ≤ 11 kW installed before 1 November 1996, smoke number 3

Table 11: Emission limit values for small residential installations firing oil with atomic oil burner (Art. 10 (1) and 8 of the 1st BImSchV)

Nominal heat output in kW	Smoke Number	Carbon monoxide in mg/kWh	Waste gas heat loss
≥ 4 ≤ 25	1 / 2 [1)]	1300	11
>25 ≤ 50 [2)]	1 / 2 [1)]	1300	10
> 50	1 / 2 [1)]	1300	9

1) For installations installed before 1 October 1988 or, on the territory of the former German Democratic Republic (GDR), before 3 October 1990, smoke number 2, unless the installations have been modified significantly after the dates indicated.

New combustion installations with a thermal fixing capacity < 10 MW may only be operated if the manufacturer can present a certificate which proves that the nitrogen oxide concentration of the waste gas as determined under test conditions expressed as nitrogen dioxide does not exceed the limit values as a function of nominal heat capacity listed in Table 12.

In addition, the manufacturer must provide evidence of the fact that the actual capacity factor does not fall below 94 % under test conditions. This only applies to new installations or existing installations which have been modified substantially and have a nominal heat capacity of more than 400 kW.

Table 12: Requirements for combustion installations firing oil which shall be confirmed by way of a manufacturer certificate (Art. 6 of the 1st BImSchV)

Nominal heat output in kW	Emission limit value nitrogen oxides under test conditions in mg/kWh	Minimum capacity factor under test conditions
≤ 120	110	-
> 120 ≤ 400	120	-
> 400	185	94

2.4 Combustion installations fired by gas

Combustion installations fired by gas are divided into installations with a thermal fixing capacity < 10 MW and those with a thermal fixing capacity ≥ 10 MW < 20 MW.

Table 13 summarizes emission limit values applicable to combustion installations firing gas with a thermal fixing capacity < 10 MW. The following gases may be used as fuel:

gases from public gas supply, untreated natural gas or petroleum gas with a similar sulphur content as well as liquefied petroleum gas or hydrogen, digester gas with a content of sulphur compounds of no more than 1 per mill by volume expressed as sulphur or biogas from agriculture, coke oven gas, mine gas, basic oxygen furnace gas, blast furnace gas, refinery gas or synthetic gas with a content of sulphur compounds of no more than 1 per mill by volume expressed as sulphur.

Table 13: Emission limit values for gas fuelled installations < 10 MW thermal fixing capacity (Art. 10 (1) of the 1st BImSchV)

Nominal heat output in kW	Waste gas heat loss
≥ 4 ≤ 25 [1) 2)]	11
>25 ≤ 50 [2)]	10
> 50	9

1) with the exception of small residential installations with a nominal heat output ≤ 11 kW

2) with the exception of combustion installations a nominal heat output ≤ 28 kW for the sole purpose of industrial water heating

New combustion installations using gases from public gas supply with a thermal fixing capacity < 10 MW may only be operated under the condition that the manufacturer is able to certify that the content of nitrogen oxides in the flue gas as a function of the nominal heat capacity expressed in nitrogen dioxide does not exceed the limits listed in Table 14.

In addition, the manufacturer must provide evidence of the fact that the actual capacity factor does not fall below 94 % under test conditions. This only applies to new installations with a nominal heat capacity of more than 400 kW.

Table 14: Requirements for combustion installations fired by gas which shall be confirmed by way of a manufacturer certificate (Art. 6 of the 1st BImSchV)

Nominal heat output in kW	Emission limit value nitrogen oxides under test conditions in mg/kWh	Minimum capacity factor under test conditions
≤ 120	60	-
> 120 ≤ 400	80	-
> 400	120	94

2.5 Medium combustion installations for oil and gas

Medium combustion installations in the range of 10 to 20 MW fired by oil or gas continue to be governed by specific regulations concerning monitoring. While those installations do not require official approval pursuant to the 4th Federal Immission Control Ordinance (4th BImSchV), they are subject to similar provisions with regard to monitoring. Thus, measurements are not performed by a chimney sweep but by a notified body as stipulated in Art. 29b (formerly Art. 26) of the Federal Immission Control Act.

In order to cover medium combustion installations, the 1st BImSchV has adopted the term “individual combustion appliance”: the Federal Government defines an individual combustion appliance as “a separate combustion device consisting of a single burner and boiler”. This

definition was necessary since the term installation would otherwise always cover the entire installation and refer to the overall capacity of an installation. This way, several individual combustion appliances may require official approval if they are used in close local proximity and in an operational context. Against the backdrop of the 1st BImSchV, the individual appliances are the decisive factor. Consequently, the term had to be introduced.

Individual combustion appliances with a thermal fixing capacity of 10 to 20 MW shall comply with the following limit values related to 3 Vol.-% oxygen:

Table 15: Emission limits for gas fuelled installations with a thermal fixing capacity ≥ 10 MW (Art. 11 of the 1st BImSchV)

Fuel	Operating temperature of the boiler in °C	CO in mg/m³	NO_x [1), 2)] in mg/m³	Smoke number
Heating oil EL	< 110	80	180	1
	110 – 210		200	
	> 210		250	
Gases provided by public gas supply	< 110	80	100	-
	110 – 210		110	
	> 210		150	
other Gases	-	80	200	-

1) when using heating oil EL, the limit value refers to the nitrogen content of heating oil EL of 140 milligrams per kilogram

2) For individual combustion installations which are regularly fired by gaseous fuels and which operate no more than 300 hours per year on heating oil EL, a NO_x-limit value of 250 mg/m³ during operation with heating oil EL applies for all operating temperatures.

The test requires a 30-minute mean value on the basis of three individual measurements. Where technically feasible, measurements should be taken at three different load stages (minimum, medium and at full load).

In addition, individual combustion installations fired by liquid fuels shall be equipped with an appropriate continuous measuring device for the smoke number. These measuring devices are performance-tested in accordance with the Uniform Practice in monitoring emissions [Bundeseinheitliche Praxis bei der Überwachung der Emissionen] (Circular of the Federal Environment Ministry of June 13, 2005 - IG I 2 - 45053/5 and circular August 4, 2010 - IG I 2-51134/0). The same requirements apply to these installations as to measuring systems for monitoring installations which require official approval. Thus, a notified body has to certify correct installation and perform an annual functional check respectively a calibration every three years. In doing so, the provisions of the VDI-Guideline 3950 “Stationary source emissions – Quality assurance of automated measuring and electronic data evaluation systems” have to be respected. Every 30-minute mean value for the determination of the smoke number shall comply with a smoke number of 1.

3 Measurement Requirements and Tasks

The emission control is performed at the operator's premises by means of suitability-tested measuring devices. The most recent testing of the chimney sweep's measuring systems performed by a notified measuring device testing body (see Annex 1) may date back no more than 6 months. Chapter 6.2 provides further information on this issue.

The chimney sweep will monitor the parameters listed in Table 16 on site.

Table 16: Parameters for surveillance measurements subject to the specific type of installation

Type of installation	Gas-fuelled	Oil-fuelled	Solid fuels
Heat medium temperature	x	x	x
Combustion air temperature	x	x	
Waste gas temperature	x	x	x
Pressure difference	x	x	x
Oxygen concentration in waste gas	x	x	x
Waste gas heat loss	x	x	
Smoke Number		x	
Test for oil derivatives		x	
Carbon monoxide	KÜO[1)]	x	x
Nitrogen oxides	x[2)]		
Dust content			x
Wood moisture			in the case of wood logs

1) The German Chimney sweep and monitoring ordinances (KÜO [Kehr- und Überprüfungsordnung]) requires CO-measurements as part of monitoring.

2) Pursuant to Art. 9 of the 1st BImSchV, nitrogen oxide emissions for gas-fuelled installations which occasionally fire heating oil (EL) shall be determined. To this effect, a measurement is to be performed. In accordance with the catalogue for interpretation of the Working Group of the Federal States for Immission Control (LAI) for the 1st BImSchV, evidence of compliance with requirements for NOx emissions may also be provided by way of a type test.

3.1 Installations requiring monitoring

3.1.1 Monitoring and measurement responsibilities for oil and gas-fuelled installations

Emission monitoring is mandatory for installations fired by gas and oil with a nominal heat capacity of 4 kilowatts and more.

Installations with a nominal heat capacity of 4 kW and more and a thermal fixing capacity below 10 MW are monitored by a chimney sweep at regular intervals:

- a 3-year-cycle for installations whose boiler has been operating for no more than 12 years,
- a 2-year-cycle for installations whose boiler has been operating for more than 12 years.

Monitoring of installations with a thermal fixing capacity of 10 to 20 MW is performed by a notified body pursuant to Art. 29b (formerly Art. 26) of the Federal Immission Control Act. The operator is responsible for repeat monitoring measurements of the components carbon

monoxide and nitrogen oxides after significant changes to the installation or else every three years. For medium-sized installations firing liquid fuels, the smoke number shall be determined continuously.

3.1.2 Monitoring and measurement responsibilities for combustion installations fired by solid fuels

Emission monitoring in operation is mandatory for combustion installations fired by solid fuels with a nominal heat capacity of at least 4 kilowatts. Single room firing installations only require on-site emission measurements in specific situations (also see chapter 2.1).

Monitoring is performed by a chimney sweep at 2-year intervals.

Given the necessary new developments for dust measuring device no appropriate measuring method was available at the time the regulation entered into force. Article 25 (6) and (7) of the 1st BImSchV therefore contain transitional provisions for monitoring requirements applying to both new and existing installations. Thus, monitoring requirements will apply to such installations which are now covered by the requirement to monitor (i.e. new installations with a nominal heat output of up to 15 kW) no sooner than 6 months after a suitable measurement method has been notified.

The first public notice of a newly-developed measuring system in the Federal Gazette was made on 20 July 2012 (Notice of the Federal Environment Agency dated 6 July 2012).

3.2 Measurement section and measurement hole

Waste gas characteristics will be determined at a suitable measurement hole. It is the operator's responsibility to create an adequate hole or to have one created.

In order to assure reproducible measurements, the measurement hole has to satisfy certain requirements stipulated in the 1st BImSchV. Thus, the measurement hole has to be placed in the connecting piece between the heat generator and the chimney and behind of the last heat exchanger or, where applicable, behind of the waste gas cleaning unit. Where two connecting pieces open into the duct separately, a measurement hole has to be set up in both connecting pieces.

The measurement hole should be located after an inlet section which is as straight as possible and has a diameter twice as large as that of the connecting pipe. In cases of shorter inlet sections, the waste gas flow may not be assumed to be sufficiently harmonized and stabilized. Conversely, the stack gas heat loss will increase in accordance with the length of the pipe for long inlet sections. This would lead to differences of evaluation when determining the stack gas loss. The measurement hole may also be situated in other places with reproducible flow conditions where no major heat loss occurs. Make sure during measurements that the measurement hole is not soiled by sediments (such as dust or soot) which might have an effect on the measurement. Where several measurement ports are available, the measurement has to be performed for every measurement port.

Figure 1 illustrates possible locations for measurement holes. Avoid measurements in channels made of brickwork (pictures b and c). Entrained air due to untight cleaning openings or cracks in the brickwork or porosity may distort the measurement.

In compliance with the requirements for measuring systems, the size of the sampling probes may be up to 13 mm. On the one hand, the measurement hole has to be large enough for swinging the sampling probe in the waste gas. On the other hand entrained air should be avoided. Therefore, the diameter of the measurement hole should not exceed 21 mm.

Swinging the sampling probe serves to determine the core flow. Pursuant to the 1st BImSchV, the measurement shall be performed in the core of the waste gas flow which is determined by means of a temperature measurement and is situated at the point with the highest temperature. For fan burners with a closed flue gas pipe, it is usually situated in the middle of the pipe. Comprehensive grid measurements as required for medium-sized combustion installations and installations requiring official approval will not be mandatory as this would neither be proportionate for small combustion installations nor feasible given the small diameter of waste gas pipes.

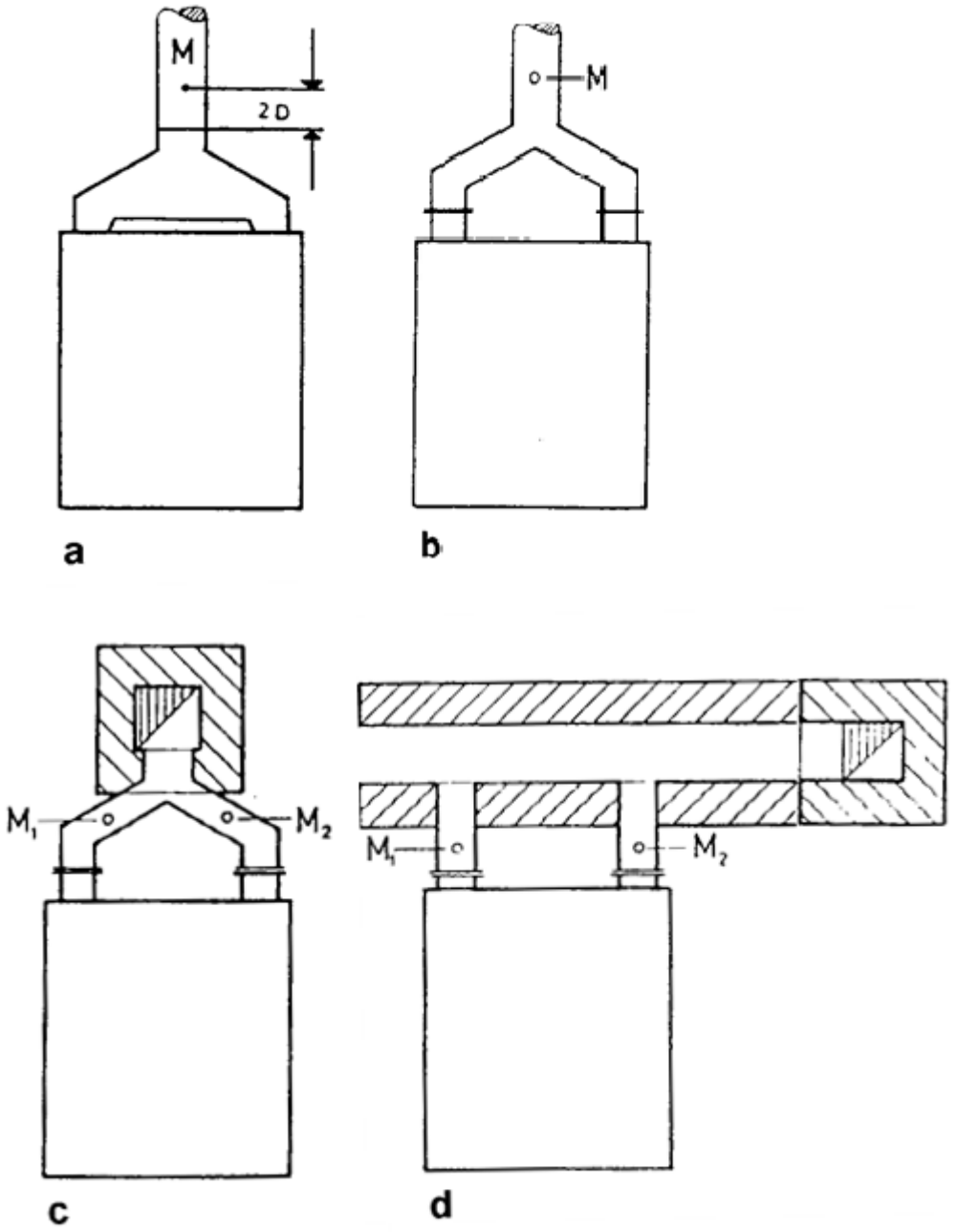


Figure 1: Examples of connecting heat generators to the chimney including the position of the measurement site (M) (© Guideline on the Uniform Practice on Emission Monitoring at plants which do not require official approval in acc. with the 1st and 2nd Federal Immission Control Ordinance, November 1997)

Figure 2 shows an example of a heat generator with atmospheric burner with flow control. Because of the flow control ambient air constantly enters the waste gas flow. This considerably limits the area of the core flow, which is why the latter is not necessarily situated in the middle of the pipe. In order to ensure a reliable measurement result in this case it is important to have a measurement point for the waste gas temperature which is close to the measurement point for gaseous components.

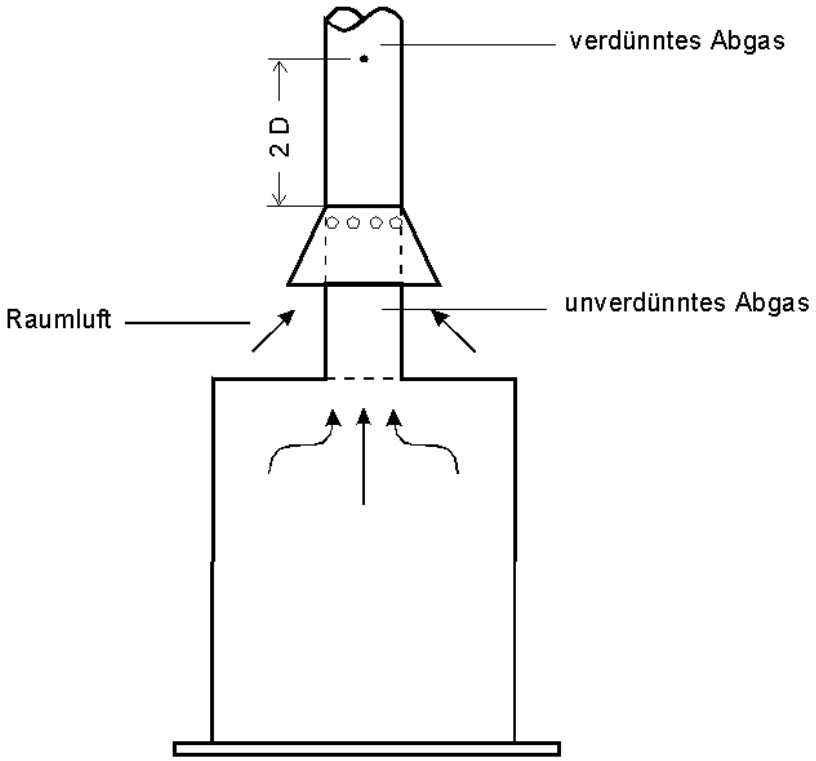


Figure 2: Example of a heat generator with atmospheric burner with flow control (© Guideline on the Uniform Practice on Emission Monitoring at plants which do not require official approval in acc. with the 1st and 2nd Federal Immission Control Ordinance, November 1997)

3.3 Measurement task

In addition to the waste gas characteristics, the heat medium temperature and the combustion air temperature will be determined. This information serves the principal purpose of providing evidence of the load level of an installation. The waste gas heat loss is calculated from the measured waste gas characteristics.

- Heat medium temperature in °C

The heat medium temperature (temperature of the boiler water) is read during measurement. It is sufficient to take the reading from the temperature gauge of the operator.

- Combustion air temperature in °C

The combustion air temperature is taken at an appropriate point of the supply pipe or at the outlet with the help of a thermometer or a thermocouple.

- Waste gas temperature in °C

The waste gas temperature is determined with an appropriate thermocouple (e.g. NiCr/Ni) or an appropriate thermometer. Temperature averages are calculated over a period of 30 seconds. The temperature measurement will help to define a representative sampling point.

- Pressure difference in hPa

The difference in pressure between the measurement site and the environment will be determined using a micro manometer.

- Oxygen (O_2) content of the waste gas in volume per cent (Vol.%)

The oxygen content of the waste gas is determined at the same time as the waste gas temperature at the same measurement point. It is determined in accordance with the measurement task in question. When determining the stack gas heat loss, the oxygen content is measured over a period of 30 seconds and a 30-second mean value is calculated. By contrast, when the dust content is determined, the oxygen content is simultaneously measured over a period of 15 minutes and a 15-minute mean value is calculated.

The O_2 content of the waste gas needs to be determined in order to provide for the reference value mentioned in the regulation to which to refer the emission concentrations for solid fuel combustion. This is the only way to compare the emissions to the limit value since the concentrations for emission limits refer to the waste gas volume under standard conditions on the one hand and to a fixed volume content of oxygen on the other.

Conversion to the reference oxygen content is based on the following equation:

$$E_B = \frac{21 - O_{2\,B}}{21 - O_2} \times E_M \qquad \text{Equation 1}$$

where

E_B = is the emission value referred to the reference oxygen

E_M = is the measured emission value

O_{2B} = is the reference oxygen content in volume % (reference value)

O_2 = measured oxygen in volume per cent in dry waste gas

Determining the end result of the measurement, the measurement uncertainty of the measurement method shall be taken into consideration.

For combustion installations firing oil and gas, the O_2 content is required in order to determine the flue gas loss.

- Flue gas loss in %

The flue gas loss describes that share of heat energy which leaves the combustion installation unused. With reference to the specific nominal heat capacity of a boiler, the following limit values have to be met.

Table 17: Limit values for flue gas loss (Art. 10 (1) of the 1st BImSchV

Nominal heat output in kW	Flue gas loss in %
≥ 4 ≤ 25	11
> 25 ≤ 50	10
> 50	9

The amount of the flue gas loss depends on the difference between the combustion air temperature and the stack gas temperature as well as the dilution factor of waste gas with

admixed air which is determined via the oxygen content of the waste gas. Fuel specific parameters are taken into consideration via the constants of the Siegert waste gas formula.

Digressing from the previous version of the 1st BImSchV, flue gas loss is no longer determined as an individual reading but as a quasi-continuous value by means of 30-second mean values in order to reduce measurement uncertainty.

Flue gas loss is calculated using the following equation:

$$q_A = (t_A - t_L) \cdot \left(\frac{A}{21 - O_{2,A}} + B\right)$$ Equation 2

where

q_A = flue gas loss in %

t_A = waste gas temperature in °C

t_L = combustion air temperature in °C

O_{2A} = volume content of oxygen in dry waste gas in %

A,B = fuel specific constants (see Table 18)

Table 18: Fuel-specific constants for the Siegert waste gas formula (Annex 2 No. 3.4.1 of the 1st BImSchV)

Fuel	A	B
Gases provided by public gas supply	0,66	0,009
Coke-oven gas	0,60	0,011
Liquid gas and liquid gas air mixtures	0,63	0,008
Heating oil EL Untreated vegetable oils vegetable oil methyl ester	0,68	0,007

Determining the end result of the measurement, the measurement uncertainty of the measurement method shall be taken into consideration.

- Smoke number/Oil derivatives

Soot emissions of oil-fired combustion plants are determined by way of measuring the smoke number. A defined portion of waste gas is sucked through a filter paper (measurement filter). The optical density of the filter paper is assessed by placing it next to a colour scale for comparison. Assessment may also be carried out using a photometer. The filter paper is also assessed with regard to unburnt oil derivatives. To this effect, the filter is visually inspected. Should this not provide unambiguous results, a solvent test using acetone is performed. Oil derivatives will be identifiable as yellow or brown stains which will form outside the soot stain.

- CO content

The CO content is determined together with the O_2 content and the waste gas temperature. For combustion installations firing solid fuel, CO emissions are defined in terms of 15-minute mean values. Determining the end result of the measurement, the measurement uncertainty of the measurement method shall be taken into consideration.

The CO limit value indicated for firing liquid fuels is indicated as mg/kWh. Most CO measuring systems available commonly deliver the CO concentration in ppm. The necessary conversion of the measured CO content to CO emissions related to the calorific value is based on the following equation:

Conversion of ppm to mg/kWh:

$$CO\left[\frac{mg}{kWh}\right] = CO[ppm] \times \rho_{CO} \times \left(\frac{21{,}0}{21{,}0 - O_{2,gemessen}}\right) \times \left(\frac{V_{A,th,tr,min}}{H_u}\right) \qquad \textbf{Equation 3}$$

Using the reference values indicated in Standard DIN EN 267 for the waste gas volume, the calorific value and the density of CO (see Table 19) gives:

$$CO\left[\frac{mg}{kWh}\right] = CO[ppm] \times 1{,}1 \times \left(\frac{21{,}0}{21{,}0 - O_{2,measured}}\right) \qquad \text{Equation 4}$$

Conversion of mg/m³ to mg/kWh:

$$CO\left[\frac{mg}{kWh}\right] = CO\left[\frac{mg}{m^3}\right] \times \left(\frac{21{,}0}{21{,}0 - O_{2,measured}}\right) \times \left(\frac{V_{A,th,tr,min}}{H_u}\right) \qquad \text{Equation 5}$$

where

$CO\left[\frac{mg}{kWh}\right]$ = carbon monoxide in mg/kWh

$CO[ppm]$ = CO concentration in Vol.ppm

$CO\left[\frac{mg}{m^3}\right]$ = CO concentration in mg/m³

ρ_{CO} = density of CO in kg/m³

$O_{2,measured}$ = measured oxygen concentration in Vol.%

$V_{A,th,tr,min}$ = minimum dry waste gas volume in m³/kg

H_u = net calorific value in kWh/kg

Table 19: Reference values for converting the CO concentration into CO emissions related to the calorific value

Fuel	ρ_{CO} [kg/m³]	$V_{A,th,tr,min}$ [m³/kg]	H_u [kWh/kg]
Heating oil EL	1,25	10,46	11,86

- Dust content

For combustion installations firing solid fuels, not only the CO content but also the dust content is limited. The latter is determined during a 15-minute measurement and is indicated as a 15-minute mean value. The result is converted into a reference oxygen content. Determining the end result of the measurement, the measurement uncertainty of the measurement method shall be taken into consideration.

Unlike its previous version, the current version of the 1st BImSchV does no longer require a specific measurement method. In addition to gravimetric methods other methods may be used. Given the increasing number of installations which require monitoring, it is preferable that the measurement method allow for on-site display of the result.

The determination of flue gas opacity using the Ringelmann scale is no longer required. This is an optical method to determine dust particle emissions in the exhaust plume. However, this method is characterized by a high degree of uncertainty and does not allow for exact assessment especially near the limit value.

- Wood moisture

The moisture content of wood significantly influences the combustion behaviour and consequently the emission of pollutants. For this reason the 1st BImSchV now requires determination of the moisture level of fuel wood. Wood moisture is defined as the weight of water in the wood as referred to the dry weight of wood (dry mass of fuel). Wood moisture content may also be above 100 %. The moisture content is usually determined by measuring the conductivity. It is also possible to use equivalent alternative measurement methods. The moisture content is specified as follows:

$$u = \frac{m_W}{m_B}$$ Equation 6

where

u = is the moisture content in %

m_W = is the weight of water contained in the wood

m_B = is the dry mass of the fuel

4 Measurement Principles and Procedures

Measurements in accordance with Articles 14 (monitoring new and significantly modified combustion installations) and 15 (periodic monitoring) of the 1st BImSchV shall be performed with performance-tested measuring systems. Performance-tested measuring systems are publicly notified as such in the Federal Gazette [Bundesanzeiger]. Further information on the procedures of emission measurements is provided in chapter 6 “Quality Assurance Measures”.

Combination measuring systems, which are able to simultaneously measure several components (i.e. CO concentration and oxygen content) or single measuring systems may be used for monitoring. Different measurement principles will be applied according to the respective component to be monitored.

4.1 Temperature measurement

- NiCr-Ni thermocouple

The thermocouple consists of two wires, nichrome and nickel which are soldered at the tip and serve as electric conductors. If there is a difference in temperature between the soldered joint and the cold junction (loose wire tips) a small electric voltage (thermoelectric voltage) is created at the loose wire tips. The higher the difference in temperature, the higher the thermoelectric voltage will be. A voltmeter is used to measure the difference and it is the read at the Celsius scale.

- Semi-Conductor Resistance

The semi-conductor resistance has an electrical conductor at the measuring sensor which increases in its resistant capacity with rising temperatures. The changes in resistance will be measured.

- Resistance Thermometer /PT 100

A resistance thermometer measures the temperature by determining the electric resistance of a metal wire winding (platinum) exposed to the temperature. The resistance is affected by the temperature which allows to determine the temperature.

4.2 Carbon monoxide and nitrogen oxides

- Electrochemical measurement

The electrochemical measurement principle relies on an oxidation or reduction mechanism of gases on catalytically active metals. Platinum is used for the detection of CO, gold is used to detect NO. The principle remains the same:

Two electrodes are separated by a thin layer of electrolytes and connected via an electrical conductor with a low resistance. Gas diffuses through to the sensor and reacts with the surface of the sensing electrode (oxidation or reduction). This will produce a current proportional to the CO concentration.

4.3 Smoke number

- Soot pump

For fuel oil fired installations, emission limits are ensured via the smoke number rather than the dust content. The procedure is specified in DIN 51402 part 1. Particles in the waste gas are separated by means of a specified filter paper with a cellulose content > 96 %. The smoke number is the optical density caused by soot after a deposition on the filter surface of 5.75l/cm². The determination of the smoke number is carried out by means of an optical comparison with an optical scale (see Figure 3): The smoke number comparison scale shall consist of white paper with a reflectance of 85 %. This corresponds to the smoke number 0. It is divided into ten comparison surfaces ranging from 0 to 9. A reduction in the reflectance by 10 % corresponds to an increase in the smoke number by 1. Consequently, the smoke number 9 only has 10 % of the reflectance of the first comparison surface. For the purpose of assessment, the sooted filter is placed beneath the comparison scale in such a way that the soot spot completely fills a hole in the scale. The greatest similarity between the filter paper and the comparison scale will indicate the smoke number.

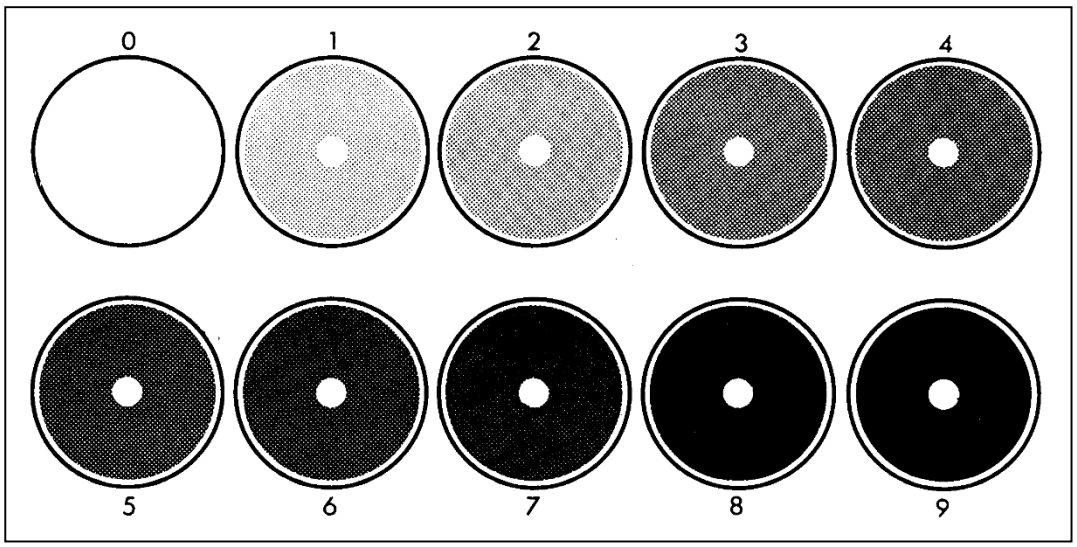


Figure 3: Smoke Number-Comparison Scale (© Guideline on the Uniform Practice in Monitoring Emissions at Installations which do not require official approval pursuant to the 1st and 2nd Federal Immission Control Ordinance, November 1997)

Hand piston pumps are primarily used as measuring systems (see Figure 4). Ten strokes will extract a volume of 1.63 l at a measurement spot of 6 mm diameter. Pull constantly over several seconds for the intake stroke then wait in the terminal position for pressure compensation in the pump. The backward push is to be performed quickly to make sure the back pressure valve closes immediately. Stroke counters have proved useful in facilitating the measurement.

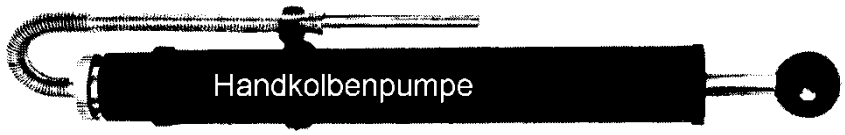
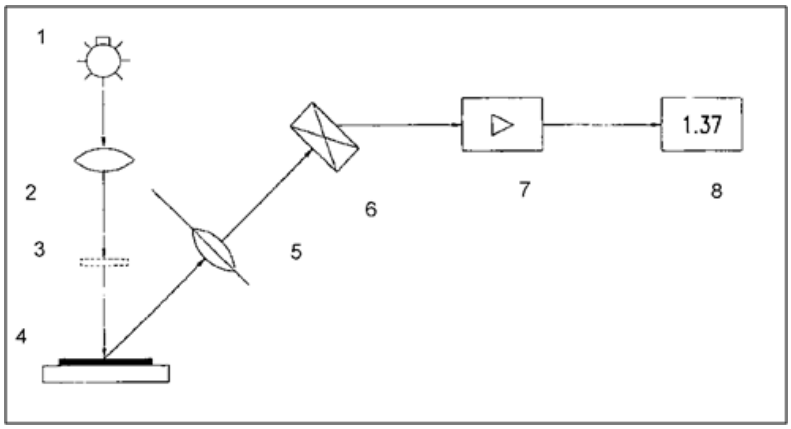


Figure 4: **Hand piston pump (© Guideline on the Uniform Practice in Monitoring Emissions at Installations which do not require official approval pursuant to the 1st and 2nd Federal Immission Control Ordinance, November 1997)**

In addition to the smoke number comparison scale, standard DIN 51402 already allows an optical assessment method for determining the smoke number in 0.1 steps with the same sample. Figure 5 provides an example of such a photometric measurement.

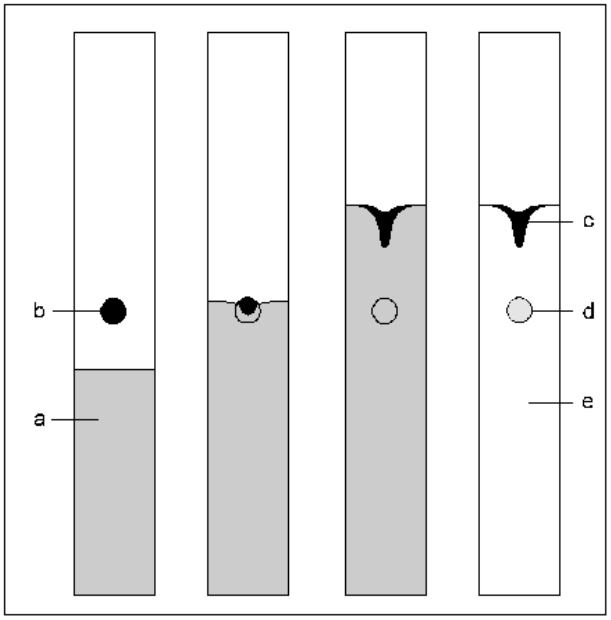


1 light source
2 compound lens
3 colour filter (vλ)
4 filter paper
5 compound lens
6 photo diode
7 electronics
8 display

Figure 5: **Photometric measurement principle for the determination of the smoke number (© Guideline on the Uniform Practice in Monitoring Emissions at Installations which do not require official approval pursuant to the 1st and 2nd Federal Immission Control Ordinance, November 1997)**

The filter paper may not be stained by any other influences than the soot deposit in order to guarantee an unobjectionable measurement. Modifications may be caused by extreme waste gas temperatures at the measurement filter. The filter material may display colours from light yellow to dark brown. Condensation may cause the sooted filter paper to become noticeably wet. These cases require an additional measurement along with the stipulated individual measurements.

Where combustion is incomplete, existing oil derivatives may be separated on the filter paper which will also lead to yellow to brown stains. This is why the filter paper shall first undergo visual inspection to identify oil derivatives. Where a clear identification is not possible, a solvent test is used to make oil derivatives visible on the measurement filter. To this effect, a strip of filter paper is dipped into a solvent (acetone). The filter soaks up the solvent and carries it beyond the soot spot thus dissolve oil derivatives. If oil derivatives can be identified, discard the filter for the determination of the smoke number. Pursuant to the 1st BImSchV, waste gas may not contain oil derivatives.



a) rising solvent
b) filter with soot and oil derivatives
c) remaining trace of oil derivatives
d) filter spot with soot, free from oil derivatives
e) filter strip, free from solvent

Figure 6: Solvent test for the identification of oil derivatives (© Guideline on the Uniform Practice in Monitoring Emissions at Installations which do not require official approval pursuant to the 1st and 2nd Federal Immission Control Ordinance, November 1997)

4.4 Differential pressure and delivery pressure draught

- Semiconductor sensor

Semiconductor strain gauges are applied to a sensor unit. The relation between changes in pressure and changes in voltage enable pressure measurements.

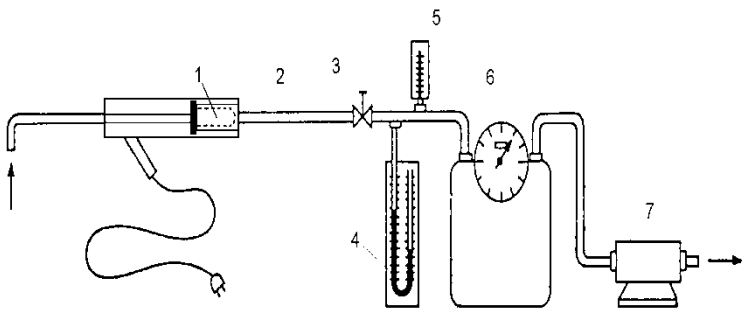
4.5 Dust

- Gravimetric methods for dust measurements

Measurement with filtering cartridge

The previous version of the 1st BImSchV required a gravimetric method for measuring dust content. This method may still be used to monitor compliance with the dust limit value of 150 mg/m^3. The measurement method is guided by the method described in VDI standard 2066, part 1. Since measurements in accordance with VDI standard 2066, part 1 would be too elaborate and expensive at installations within the scope of the 1st BImSchV, the method has been simplified for small combustion installations. A defined gas stream of 9 l/min - i.e. 135 l in total - is taken from the waste gas via a measurement filter over a period of 15 minutes. At a flow velocity of 4 m/s and a temperature of 270 °C these conditions correspond to isokinetic sampling in accordance with VDI guideline 2066, part 1. The filtration temperature is set at 70 °C as possibly existing resin and tar components may also be separated on the filter in addition to particulate matter. Coverage thus also depends on the temperature during separation. The measurement filters are weighed in a central laboratory of the central association of guilds of the chimney sweep craft [Zentralinnungsverband (ZIV) des Schornsteinfegerhandwerks]. Consequently, they are handed out with a filter-ID by the

laboratory; the measurement result is determined in the laboratory after deposition by weighing. The defined gas stream depending on the specifics of an installation allows for the determination of a dust concentration in the waste gas referred to m^3.



1	sampling probe with inserted filtering cartridge and heat connector
2	hose
3	throttle valve
4	mercury manometer
5	thermometer
6	gas meter
7	pump unit

Figure 7: General design of dust content measurements using a filtering method (© Guideline on the Uniform Practice in Monitoring Emissions at Installations which do not require official approval pursuant to the 1st and 2nd BImSchV, November 1997)

Given the latest developments in dust measuring methods, this method is likely to lose importance over time. The number of installations which require monitoring has increased significantly with the latest version of the 1st BImSchV. Thus, methods which allow immediate readings of measurement results on-site as well as monitoring compliance with the new limit values for dust will increasingly be used.

Frequency measurement

The latest gravimetric methods for measuring dust are already able to offer on-site determination of the dust concentration. Processing steps for filter conditioning are no longer necessary. Measurements currently available in the market are based for example on frequency measurements, i.e. the dust content is determined indirectly via a frequency shift registering increasing dust concentrations.

- Optical measurement methods

Various optical methods may be used to determine the dust concentration. The dust load is indirectly determined using transmission or extinction as auxiliary variable. Thus, the dust concentration may be determined with the help of a photometer. The light beam led through the waste gas flow is weakened as a function of the dust load given absorption and scattering caused by particles. Transmission refers to the ratio of received to emitted light. The reciprocal value of transmission is called extinction.

Methods of this kind are commonly used for continuous monitoring of installations requiring official approval.

Meanwhile, some measuring systems using optical methods exist for the scope of application of the 1st BImSchV.

4.6 Oxygen

- Electrochemical measurement

This method uses a 2-electrode measuring principle. Atmospheric oxygen is deoxidised at the working electrode to form water. Lead is oxidised at the counter electrode. This causes an electric current with serves to determine the O_2 concentration.

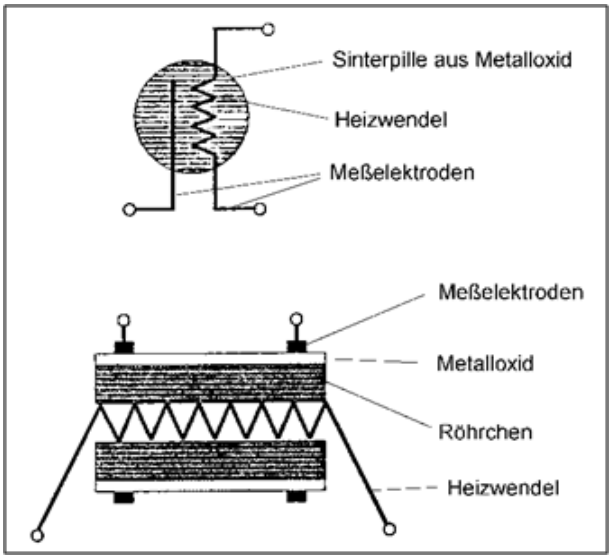


Figure 8: Design of a metallic oxide sensor (© Guideline on the Uniform Practice on Emission Monitoring of Plants which do not require official approval pursuant to the 1st and 2nd Federal Immission Control Ordinance, November 1997)

5 The Process of Emission Measurement

VDI standard series 4207 is currently being prepared for the procedure of emission measurements at installations within the scope of the 1st BImSchV. Various parts will specify procedures for performing and assessing measurements at different types of installations. Moreover, criteria to be taken into consideration with regard to storing fuels will also be included.

- General requirements

Before performing the measurement, the installation is checked against information in the fireplace certificate for new installations or significant modifications.

It is usually not necessary to check the fuel in case of oil and gas-fired installations. It is however recommended to inspect the location of installation and to question the operator where applicable.

The emission behaviour of a fireplace burning solid fuels largely depends on the way it is operated and the fuel used. In order to avoid operating errors, an operator of an existing hand-fed combustion installation shall consult advice on correct operation of the fireplace, good storage practice as well as specific aspects to be considered when firing solid fuels by December 31, 2014. Operators of a new hand-fed installation shall get advice within a one-year period.

- Preparation of the measurement

On the occasion of emission measurements at installations firing solid fuels, the combustion chamber, the ash pan and the hot gas flues as well as the combustion air supply of the fireplace and the connecting piece should be cleaned before starting the measurement. Moreover, basic fire bed shall be created by operating the fireplace with regular fuels (preferably beech) for a period of 30 minutes. This will ensure that the fireplace will have reached the operating temperature for performing the measurements. Pellet stoves shall be operated for a minimum of 20 minutes at full capacity in order to reach an uninterrupted state of continuous operation. The operator may carry out these preparatory tasks.

Before starting the measurement, the chimney sweep shall inspect the technical condition and the functional capacity of the measuring system. The manufacturer's instructions for commissioning shall be taken into consideration. The sampling system, filter cartridges and condensate traps need to be dry and clean. A leak test shall be performed before starting the measurement.

- Performance of the measurement

Measurements are performed at the measurement hole in the core of the waste gas flow. If an installation has several measurement holes, measurements take place at every measurement hole. A reliable assessment can only be made on the basis of a complete measurement programme. This is why the test programme shall always be completed even in case of a negative measurement.

Measurements are taken during uninterrupted operation at nominal heat output or, alternatively, at the maximum selectable heat output. The objective here is to obtain representative and comparable measurement results. For the purpose of determining the

installation's operating status, the pressure difference between flue gas and ambient air is measured and the waste gas temperature determined. The temperature taken by the operating measuring system inside or behind the heat producing unit shall also be recorded.

Oil and gas firing

For gas and oil-fuelled installations with an atomizing burner, measurements shall start no sooner than 2 minutes after switching on the burner. For oil-fired installations with vaporisation burner, the measurement shall start no sooner than two minutes after adjusting the nominal heat output.

For warm-water heating systems, the boiler water shall have a minimum temperature of 60 °C. The minimum temperature does not apply to warm-water heating systems whose operating temperature for the intended use lies below 60 °C For example, this applies to condensing boilers or low-temperature boilers with flexible adjustment for instance.

In accordance with standard DIN 51402-2 (version dated October 1986) measurements to determine the smoke number for oil-fired installations shall be repeated 3 times. An additional individual measurement is necessary when the filter paper has been dampened by condensation or unevenly displays optical density. Where pumps are operated manually, strokes shall immediately succeed one another and the duration of an intake stroke shall be approximately 3 seconds. A waiting period has to be observed in order to ensure pressure compensation. With automatic pumps, the measurement has to be completed within 60 seconds.

The presence of oil derivatives in the waste gas is determined visually with the help of deposition on the filter papers used for the determination of smoke numbers. Oil derivatives can be identified by yellow or brown staining at the edges of the soot stain on the filter paper. In the event of such a stain, the filter paper shall be discarded for the determination of the smoke number. Where a clear decision is not possible, the filters are submitted to a mobile solvent test in accordance with standard DIN 51402-2 (version dated March 1979).

In order to determine the flue gas loss at oil and gas-fuelled installations, the oxygen concentration and the waste gas temperature are measured quasi-continuously as average over a 30-second period at the same point in the core flow. The temperature of the combustion air is taken at the intake of the heat generating device; this should be done in parallel with measuring the waste gas temperature. For balanced flue installations, the combustion air temperature is taken at an appropriate point of the supply tube. The measurement may not be initiated before measurement values for temperature and oxygen concentration have stabilised.

Furthermore, for oil-fuelled installations with atomizing and vaporization burner, carbon monoxide emissions in mg/kWh shall be determined. The 1st BImSchV does not include any provisions for the performance of the measurement in annex 2. The interpretative questions on the 1st BImSchV (August 2011) already point to VDI guideline 4207, part 1 "Emission measurement at small firing installations – Measurements at installations for gaseous and liquid fuels". This guideline will include provisions on the performance of this measurement, but it is currently still being prepared. Until publication date, the measurement may be performed in accordance with the provision of working paper 104 of the ZIV in combination

with annex 2, clause 3.1 of the 1st BImSchV. In analogy to the working paper it is recommended to perform the CO measurement at the same time as the measurement of the stack gas temperature and the oxygen content in order to determine the flue gas loss. The oxygen content determined by means of determining the stack gas heat loss may then be used for the conversion into the CO content.

Combustion installations burning solid fuels

For combustion installations firing solid fuels the dust and CO concentrations shall be determined. The measurement is taken at a boiler temperature of at least 60 °C. Furthermore for hand-fed installations, the largest indicated quantity of fuel mentioned in the manufacturer's instructions shall be fed to a layer of embers appropriate for ignition. The measurement may start no sooner than 5 minutes after fuel feeding. As the results of both dust and CO are related to a reference oxygen content, emissions shall be determined simultaneously with the oxygen content of the waste gas.

For existing hand-fed combustion installations without buffer storage, emission limit values for dust and CO shall be complied with in the case of restricted fuel supply for fuels in accordance with numbers 4 and 8 of the 1st BImSchV. Performance of the measurement depends on whether the installation is equipped with a controlled or non-controlled combustion air fan or none at all. If the installation is not equipped with a combustion air fan, the 15-minute measurement shall take place with the combustion air damper open for a duration of 10 minutes and closed for the remaining 5 minutes. For installations equipped with an uncontrolled combustion air fan, the measurement shall be taken with the fan switched on for 5 minutes and switched off for 10 minutes. In the event of a controlled combustion air fan, the measurement shall be taken over a period of 15 minutes with a reduced combustion air supply. New hand-fed installations firing these fuels are generally equipped with a buffer storage.

- Evaluation and assessment of the measurements

The arithmetic mean is calculated from the individual measurements of the smoke number. The value is rounded to the nearest whole number. The smoke number is in compliance with the limit value if the rounded value does not exceed the value stipulated for the smoke number. In addition, all filter papers shall be free from oil derivatives. Considering measurement uncertainty is not required in this case.

CO values determined for oil-fuelled combustion installations are usually expressed in ppm. In accordance with standard DIN EN 267, these values shall be converted to mg/kWh (see equation 3, chapter 3.3).

Comparing the measured values with the limit values for solid-fuel combustion installations, the measurement uncertainty of the method for measuring dust and CO is taken into consideration. For oil and gas-fuelled installations, the measurement uncertainty shall be presented for the flue gas loss. Also, the flue gas loss is calculated using equation 2 (see chapter 3.3) from the averages of the quasi-continuous measurement of the stack gas temperature and the oxygen content as well as the measured values for the oxygen content and the combustion air temperature.

Number 2.3 (Annex 2) of the 1st BImSchV describes how to proceed with the results considering measurement uncertainty and how to perform assessment with the limit value. The measured value is reduced by the measurement uncertainty, i.e. the latter is rated in favour of the installation's operator. The result shall be expressed with an additional digit compared to the figure of the emission limit value stipulated after conversion to the standard or reference oxygen content. This means that measuring systems too need to be able to display digits accordingly. The result is rounded in accordance with DIN 1333, no. 4.5.1 (version dated February 1992).

In the following, a simplify example of the calculation for assessing the dust limit value is given. Please note that relating the value to the reference oxygen content is not considered here; a value of 30 % referred to the limit value is assumed for the measurement uncertainty of measurement device.

Compliance with a dust limit value of 0.6 g/m³ is to be monitored at a combustion installation firing solid fuels.

The following situation serves as an example:

Limit value: 0.06 g/m³

Measurement uncertainty: 0.018 g/m³

Measured value: 0.0524 g/m³

Initially, the values used for calculation are indicated with one digit more than the applicable limit value. Unnecessary digits are deleted (not rounded):

Measured value: 0.052 g/m³

Measurement uncertainty: 0.018 g/m³

In accordance with the 1st BImSchV the measurement uncertainty shall be deducted from the measured value. This will result in:

0.52 g/m³ - 0.18 g/m³ = 0.34 g/m³

The result is then rounded in accordance with DIN 1333, no. 4.5.1. The result is obtained from adding half the place value of the rounded digit and then deleting digits after the rounded digit.

0.034 g/m³ + 0.005 = 0.039 g/m³ –> Result: 0.03 g/m³

Thus, the limit value is complied with in the example.

It is likely that VDI guideline 4207 part 2 will stipulate specific values for the measurement uncertainty for dust and carbon monoxide. Moreover, it is envisaged to no longer refer the measurement uncertainty to the limit value but to deduce it from the measured value immediately in practice. Both values, i.e. the measurement uncertainty and the measured value, shall be converted to the reference oxygen content prior to that. Therefore, the final assessment value concludes by subtracting the referenced measurement uncertainty from the converted measured value.

- Reporting

The chimney sweep shall confirm the results of the measurements to the operator. The 1st BImSchV stipulates a minimum degree of information which should be given in certificates.

For combustion installations firing liquid and gaseous fuels information primarily covers general information such as information on the owner, the type of installation, the burner and the heat exchanger, the fuel used and the measurement results. Information shall also be given on other tasks involved in monitoring such as checking the manufacturer certificate (Art. 6 (2) and (3) of the 1st BImSchV).

The following information is required when documenting measurement results:

- heat medium temperature,
- combustion air temperature,
- waste gas temperature,
- oxygen concentration in waste gas,
- pressure difference,
- the determined flue gas loss including measurement uncertainty,
- the applicable limit values according to 1st BImSchV,
- for installations firing liquid fuels: results from all individual measurements as well as the mean value from the determining the smoke number and the result of checking for oil derivatives.

Since a specified form is no longer used, the design of the confirmation may be selected according to preferences. A confirmation presented in annex 2 of the German Chimney sweep and monitoring ordinances [Kehr- und Überprüfungsgsordnung] of June 16, 2009 may serve as a useful example.

For combustion installations firing solid fuels, this information also includes general information, measuring results and information on other monitoring tasks. Instead of information on the burner and the heat exchanger, however, information on the fire place shall be given.

In the event of a measurement during commissioning, information on advice given correct operation of the fireplace, good storage practice as well as specific aspects to be considered when firing solid fuels is required in addition (Art. 4 (8) of the 1st BImSchV). Furthermore, information shall be given on whether or not a manufacturer certificate on type testing for single room firing installations or, where applicable, on the suitability and approval of downstream devices for the reduction of dust emissions, was available (in acc. with Art 4 (3) and (6) of the 1st BImSchV).

In case of combustion installations firing solid fuels, documentation of measuring results shall cover the following:

- heat medium temperature,
- waste gas temperature,
- oxygen content in waste gas,
- pressure difference,
- dust and carbon monoxide content determined in the stack gas also indicatingthe measurement uncertainties, and
- limit values applicable to the installation in accordance with the 1st BImSchV.

Information on monitoring the requirements of Art. 4 (1) (technical condition, fuels, installation and operation) as well as the moisture content of the fuels specified in Art. 3 (1) No. 4, 5 and 6 to 8 shall be provided in the section for information on other monitoring tasks.

The ZIV has made suggestions for the confirmations which cover monitoring of the following installations:

- certificates for newly installed or significantly modified single room firing installations firing solid fuels,
- certificates for newly installed or significantly modified small firing installations firing solid fuels with the exception of single room firing installations,
- certificates for existing single room firing installations firing solid fuels,
- certificates for existing small firing installations firing solid fuels with the exception of single room firing installations.

These confirmations are presented in annex 2.

Where requirements are not complied with, the 1st BImSchV specifies that the operator of the installation shall remove the defect and that the chimney sweep shall repeat the measurement in order to confirm compliance with the requirements. The Chimney Sweep Crafts Law [Schornsteinfegerhandwerksgesetz (SchfHWG)] states more precisely that removal of the defect shall be demonstrated within 6 weeks after the day by which the chimney sweep tasks were to be performed pursuant to the stipulations made in the fire place certificate. In the event of non-compliance the chimney sweep shall communicate the defect to the competent authority. Defects shall be communicated immediately to the competent authority where a risk to operational and fire safety or of harmful effects on the environment is imminent.

6 Quality Assurance Measures

6.1 Performance testing of measuring systems and procedure of public notification

Art. 13 of the 1st BImSchV stipulates that measurements required by Art. 14 and 15 of the same ordinance be carried out using performance-tested measuring systems. The performance test of measuring systems is necessary to ensure consistent emission measurements and non-discrimination of installation operators.

Test procedures and their performance criteria for measuring systems intended to measure emissions at small firing installations have been substantially revised in recent years and have been defined in VDI guideline 4206 part 1 to 4. The performance criteria specify the parameters set by the legal provisions and which the measuring systems have to comply with. The technical implementation is left to the manufacturer of the measuring system.

In accordance with the Uniform Practice in monitoring emissions from small firing installations pursuant to the 1st BImSchV (circular issued by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in the Joint Ministerial Gazette on December 12, 2011 (GMBl 2012 no. 1 p. 11)), the VDI guideline series 4206, parts 1-3 shall be applied to performance testing and replace the requirements specified in the circular issued on January 31, 1997 (GMBl 1997, no. 33, p. 522). Last mentioned circular specify directly performance criteria for measuring devices for the determination the smoke number, measuring devices for the determination of flue gas loss for monitoring oil and gas firing installations as well as for measuring devices for monitoring small firing installations firing solid fuels.

The new guideline series was developed given the new requirements of the 1st BImSchV, as for example revised limits values for dust or the determination of stack gas heat loss over the period of 30 seconds. These changes also imply the need to adapt the state of the art accordingly.

To this day, the standard series has four parts of which the three listed below shall be applied in performance testing in accordance with the circular mentioned above:

- VDI 4206 part 1: Measuring devices for the determination of gaseous emissions and flue gas parameters (August 2010),
- VDI 4206 part 2: Measuring devices for the determination of particulate emissions (June 2011),
- VDI 4206 part 3: Measuring systems for the determination of the smoke number (August 2010).

An additional part of the VDI guideline series 4206 was published as white paper in August 2013. This has not yet been incorporated in the Uniform Practice in monitoring emissions from combustion installations.

- VDI 4206 part 4: Performance criteria and test procedures for measuring devices for monitoring emissions at small firing installations – Measuring devices for the determination of moisture content of lumpy wood (August 2013)

Performance test

In general, the manufacturer of a measuring system commissions a qualified test institute at his own expense to carry out performance test.

Performance tests may only be carried out by test institutes which are accredited to DIN EN ISO/IEC 17025. Furthermore, the test institute shall be notified in accordance with art 29b (formerly Art. 26) of the Federal Immission Control Act. This goes hand in hand with evidence of at least five years' experience in the field of functional tests and calibrations of measuring and data evaluation systems for organic and inorganic compounds as well as particulate matter. Furthermore, experience with installations in the scope of the 1st BImSchV has to be demonstrated.

Performance tests shall be carried out by skilled personnel of the test institute; only the test for electromagnetic compatibility may be delegated to other bodies. Test institutes shall perform their tasks in a competent and independent manner. The test institute shall use its own equipment to carry out performance tests. Where test materials provided by the manufacturer are used in justified exceptional cases, these shall be verified before putting them to use.

Tests and approval certificates issued by test institutes of other member states of the EU or the European Economic Area (EEA) are considered equivalent if certain conditions are fulfilled. In particular, these include:

- the tests have been performed in accordance with VDI guideline series 4206 or in accordance with a technically equivalent procedure which includes permanent testing corresponding to 6 months operation in practice (apx. 2000 measurements or 400 in the case of small firing installations firing solid fuels) and
- the test body needs to provide evidence of its experience in performing emission measurements at small firing installations, in calibration of continuous measuring systems and in device testing; this may be done by way of nomination by the competent body of a member state and
- the test institutes are accredited for the relevant tests in accordance with the standard series EN ISO/IEC 17025 (version dated August 2005) by an evaluated accreditation system by the ILAC (International Laboratory Accreditation Cooperation).

For the purpose of performance testing, the manufacturer will deliver at least two test items of identical design to be tested by the test institute. The measuring system comprises all components required for the performance of measurements and devices of the method which are required to obtain measurement results (sampling system, sample treatment, data output etc.). The instruction manual provided by the manufacturer shall also be considered during testing.

In addition to the general requirements such as the design of the measuring system, the type plate and the instruction manual, tests are grouped in various categories. This includes:

- mechanical tests,
- test of voltage supply and software,
- tests with test gases,
- tests with real gases,
- verification of calculations of parameters,
- verification of temperature measurements, and
- verification of pressure measurements.

The following information serves to illustrate a number of test items (VDI 4206). These are intended as examples only and do not outline the entire performance test.

Mechanical tests

Test point – drop test:

The measuring instrument is dropped from a height of 0.5 meters on to a concrete surface. This test is performed for all hand-held instruments. The functionality of the instrument may not be affected by dropping on the floor. This test serves to demonstrate whether the instrument still function after such a realistic strain.

Test point – flow indicator:

Blocked filters or ducts may disturb the flow of the waste gas to be measured. This will disable a reliable measurement. The measuring system has to be capable of detecting this and issue a warning signal. For the purpose of performance testing, the probe inlet is blocked to check this function.

Tests using test gases or dominant measurands (for dust measuring devices)

The VDI guideline 4206 part 1 defines various test gas mixtures with which to perform tests. The specific mixture to be used will depend on the component and the intended application of the measuring system to be tested (i.e. for oil/ gas firing, and/or solid fuels). Test gas mixtures are required for a number of test items such as:

Test point – response time:

The measuring systems are first purged using ambient air. Subsequently, the test gas mixture is applied and the time necessary for the measuring system to reach 90 % of a final stable reading is determined. Measuring systems shall be able to respond to fluctuations of the waste gas within a specific time.

When testing dust measuring systems it is not possible to apply a test gas mixture in order to verify their functionality. In this case, a dominant measurand is used. This might be a specific sample volume which is to be taken in a specific time by the sampling device. Thus, operability of the instrument when testing the cold start is inspected as follows:

Test point – cold start:

Measuring systems are stored at a temperature of 0°C for a duration of 2 h. After that time, the instruments have to be operable within 10 minutes. For dust measuring systems and the determinant measurement variabledominant measurand 'sampling volume', for instance, the specified volume is sampled and tested and it is thus demonstrated that the measuring system is able to fulfil this monitoring task in practice within 10 minutes.

Tests with real gases

Tests with real gases are performed at various small firing installations with the relevant fuels with regard to the intended application of the measuring system. Reference measuring systems record all components existent in the flue gas during the measurement. When performance testing dust measuring systems, installations are fed with various solid fuels as the characteristics of particulate matter such as colour and size may vary according to the fuel used or the combustion conditions. This is a critical issue for optical dust measuring methods in particular. Therefore, small firing installations for solid fuels are operated during the performance test of dust measuring systems such that various combustion conditions are covered. This may refer to the feeding method (hand-fed or automatic feeding) or the characteristics of the fuel (moisture content of the fuel), for instance.

Thus, the following test criteria specified in the guideline series are based on tests with real gases and comparison measurements with a reference method:

Test point – determination of the measuring deviation

A fixed number of measurements is taken with the measuring system under test and the reference method The measuring deviation is determined by establishing the difference between the tested measuring system and the reference method. The measuring deviation shall not exceed the performance criterion.

Test point– determination of the expanded uncertainty:

The measurement uncertainty is determined from the comparison measurement between the test specimens and the reference method and is a conservative estimate.

Multiplication with a student factor for a statistical confidence of 95 % and a number of degrees of freedom N (number of measurements) serve to determine a measurement uncertainty. The latter shall be compared to the relevant minimum requirement.

Additional requirements apply for filter materials and the comparison scale in the case of testing smoke number measuring systems.

Moreover, the instruments undergo an endurance test as part of the performance test. Depending on the intended application, the measurement system shall perform a specified number of complete measurement cycles. The minimum requirements shall be met. This test serves to demonstrate that the measuring system is still able to meet the performance criteria in practice after several measurement cycles.

Furthermore, the guideline presents requirements for test equipment and the test institute in charge of testing.

As soon as all required tests have been performed and the relevant performance criteria have been met the test institute will draw up a test report. This test report presents details on the measuring system and its measuring principle as well as test results for the individual performance criteria. The manual also forms part of the test report.

Procedure for the notification of suitability

The test institute submits the test report on the performance test to an expert body for adoption. This body is made up not only of representatives of the German Länder and the Federal Environmental Agency but also of representatives of the test institutes. The members of the body carefully examine the report on the performance test and put forward a recommendation for the notification to the Working Group of the Federal States (Bund/Länderarbeitsgemeinschaft) for Immission Control (LAI), commission air quality, impacts, traffic (L/W/V). If the Working Group of the Federal States for Immission Control will result in a general positive assessment the qualification of the tested measuring device shall be published in the Federal Gazette (Bundesanzeiger) by the Federal Environmental Agency.

The notification of a measuring system contains the following information:

- the measuring system's designation
- manufacturer
- measured components (lists the performance-tested functional modules)
- field of application (intended application of the measuring system)
- measured ranges during the performance test
- software version
- restrictions (e.g. it may turn out during the performance test that the measuring system cannot be used given specific peripheral parameters; this may be phrased accordingly in the restrictions section)
- notes (this section may contain aspects with regard to use and operation which might be of interest to the user but which do not present any restrictions)
- test institute
- test mark
- test report

Only the measuring system specified in the test report may be advertised as performance-tested. In order to ensure consistent quality over time of the performance-tested measuring system, regular inspections of the manufacturing process are mandatory.

The quality of materials pertaining to the measuring system which have been part of the performance test (such as filter materials) but which are not produced by the manufacturer of the measuring system shall be verified. This test shall be performed by a test institute at least once a year.

Should it be necessary to make changes to the measuring system after the performance test, such changes shall be communicated to the test institute by the manufacturer. Based on the type of change, the test institute will assess whether a re-testing or supplementary testing will be required. A retesting consists of a complete performance test including new public notification. A supplementary test comprises verification of whether or not individual performance criteria of the applicable standard which may be affected by the change are satisfied. Supplementary testing may, in principle, only be performed within five years of the initial public notification. This procedure applies to hardware and software alike.

6.2 On-going monitoring of performance-tested measuring systems

Measuring systems used for emission monitoring shall be tested by a measuring device testing body twice a year. This biannual test serves to contribute to maintaining the measuring devices in perfect technical condition. Measuring results obtained by means of measuring systems which are not performance-tested or whose most recent test dates back more than 6 months may not be used. On grounds of European law, technical test houses of the chimney sweep guilds are no longer specifically referred to in the 1st BImSchV and also require notification according to federal state law [Quote ZIV sheet 601]. Measuring device testing bodies are publicly notified by a competent authority according to applicable federal state law. Publication of the notified measuring device testing bodies is currently done in part on the website of the notifying authority. For the future, it is planned to publish these bodies on a central internet platform.

A list of notified measuring device testing bodies which perform periodic testing of performance-tested measuring devices systems is enclosed in the annex.

Measuring device testing bodies need to comply with the performance criteria stipulated in VDI guideline 4208, part 2. Some of the essential aspects are briefly addressed in the following:

A measuring device testing body needs to comply with certain management requirements. In addition to the requirement of competence and the presence of sufficiently qualified personnel this includes the guarantee of the body's personal and economic independence from their customers as well as the reliable completion of the tasks assumed. Thus for example, reliability is no longer given if the test results are modified substantially or through negligence.

A body's professional competence is not only ensured by specialised technical knowledge, it also requires an equipment required to fulfilling its tasks. Personnel resources include a technical supervisor as well as at least one deputy for this position. Among others, these people shall demonstrate knowledge of the relevant legal regulations, the technical standards and the notification procedure. Moreover, they shall demonstrate knowledge of measurements at different firing installations for solid, liquid and gaseous fuels. VDI guideline 4208, part 2, defines the requirements in terms of education applying to the technical supervisor and his or her deputy as well as those applying to other competent personnel. Where personnel does not meet these requirements they may only be employed as support personnel rather than for the independent performance of tasks which are relevant to the results.

The accommodation available to the measuring device testing body shall allow correct performance of the tests and provide environmental conditions which do not negatively

influence test results. In case of environmental conditions, which can impact the test results, the former shall be documented.

Any test equipment required for measuring device testing shall be available. Annex A of VDI guideline 4208 part 2 presents a list of required equipment along with specifications and accuracies. Requirements of the test gases used are also specified there. Test equipment shall be clearly marked and may only be operated by authorised personnel. Records shall be available for the test equipment. These should cover among others the version of the software used, data on calibrations and adjustments, approval criteria and the date of the next check.

The measuring device testing body shall have procedures for handling of test equipment. Thus, measuring instruments submitted for testing shall be labelled clearly in order to avoid mix-ups. This does not only apply to the instruments as such but also to records and other documents in which references are made. In order to establish whether or not a measuring system used is indeed performance-tested and declared suitable, the measuring device testing body shall have a list of all performance-tested measuring devices. Test certificates shall not be issued if the version submitted for testing is not identical to the one declared suitable.

Annex B of VDI guideline 4208 part 2 provides an example of how to present a test report. The results of the individual tests shall be documented correctly, uniquely and objectively. The measuring device testing body shall only issue a certificate, if the test has been passed; it shall clearly state the name of the testing body and the measuring system as well as the expiry date of the certificate.

The measuring device testing body shall maintain a quality management system in accordance with EN ISO 9001. This serves to guarantee compliance with the minimum requirements stipulated by VDI guideline 4208 part 2. The measuring device testing body does not need accreditation, however, shall be verified as part of the notification procedure by a body accredited according to DIN EN ISO/IEC 17020 or DIN EN ISO/IEC 17025. The latter verifies whether the requirements for personnel resources and the technical requirements are met and whether a suitable quality management system is maintained. This shall be repeated at least every other year in order to maintain accreditation.

6.3 Performance test / type test of small single room firing installations

Die Eignungsprüfung / Typprüfung von Einzelfeuerungsanlagen dürfen nur von Stellen durchgeführt werden, die für Prüfungen nach der Richtlinie 89/106/EWG vom 21. Dezember 1988 zugelassen sind. Am 9. März 2011 wurde vom Europäischen Parlament und dem Rat der Europäischen Union eine neue Verordnung zur Festlegung harmonisierter Bedingungen für die Vermarktung von Bauprodukten erlassen. Diese Verordnung (EU Nr. 305/2011) ersetzt ab Juli 2013 die Richtlinie 89/106/EWG. Die Eignungsprüfung / Typprüfung von Einzelfeuerungsanlagen für feste Brennstoffe wird nach der genannten Richtlinie / Verordnung und zusätzlich nach folgenden technischen Regeln durchgeführt:

DIN EN 13240, September 2004:	Roomheaters fired by solid fuel – Requirements and test methods
DIN EN 15250/A1, June 2007:	Roomheaters fired by solid fuel – Requirements and test methods (flat layer firing and feeder firing)

DIN EN 13229/A1, October 2005	Inset appliances including open fires fired by solid fuels - Requirements and test methods (insert appliances closed)
DIN EN 12815, June 2001:	Residential cookers fired by solid fuels Requirements and Tests (Cookers and boilers)
DIN EN 14785, September 2006:	Residential space heating appliances fired by wood pellets – Requirements and Test Methods (Pellet stoves with and without water pockets)

The operator of an installation shall present the test certificate for the fire place issued by the manufacturer to the chimney sweep. This test certificate can be requested from the dealer/manufacturer. The HKI Industrieverband Haus-, Heiz- und Küchentechnik e. V. (industrial association domestic, heating and kitchen technologies) provides a database on its homepage which gives information on whether an installation has undergone and passed type testing [ZIV working paper 601].

Chapter 2.1 "small single room firing installations" provides additional information on the relevant minimum requirements.

7 Competent Bodies

Operators of small firing installations are obliged to arrange the chimney sweeper work prescribed in due time. With regard to these works there have been significant changes. Measurements no longer have to be performed by the district chimney sweep for a specific area. Any registered chimney sweep may be commissioned to perform the measurement. This results in a certain freedom of choice. Evidence of monitoring has to be communicated to the district chimney sweep, however, since s/he continues to be responsible for proper monitoring in his/her district.

Measurement results are reported to the state guild association [Landesinnungsverband] by the district chimney sweep. The state guild associations collect all results and create overviews which they present to the relevant federal state authorities. The Federal Ministry for the Environment will receive a summary for all federal states from the central Guild Association. This will ensure that information on the situation of small combustion installations can be assessed comprehensively and that the insight gathered can be taken into consideration where new regulations become necessary.

By way of conclusion the following may be stated: The operator of an installation is responsible for arranging the performance of measurements. A chimney sweep is responsible for performing measurements at small firing installations. Performance of measurements at medium firing installations fired by heating oil EL and gaseous fuels is performed by a body declared competent in accordance with Art. 29b (formerly Art. 26) Federal Immission Control Act. Measurements shall exclusively be performed with performance-tested measuring instruments. Performance tests are carried out by test institutes. Measuring devices shall also be tested twice a year by a measuring device testing body. The relevant federal state authorities in accordance with federal state law are responsible for notification of measuring device testing bodies.

8 Overview of Performance-Tested Measuring Systems

The following tables list all measuring systems for which either a performance test or a supplementary test in accordance with guideline VDI 4206 parts 1, 2, 3 or 4 has been carried out – as of 1 April 2014 (Note: Publications in the Federal Gazette (Bundesanzeiger – BAnz.) contain more detailed information for example on possible fields of application.)

Measuring systems for the determination of the smoke number

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
ET-XL209	Engelhardt & Trunzer GmbH, Wesel	FG	15/12/2010	190	4183	
		BANZ.	29/07/2011	113	2733	II, 1. Notification (no. 25): - Comments on performance testing
NOVAPlus	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	23/07/2013	B5	3	

Measuring devices for monitoring CO emission limit values and the flue gas loss at combustion installations fired by oil and gas

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Ecom-EN2	rbr Meesstechnik GmbH, Iserlohn	BAnz.	12/02/2010	24	557	
		BAnz.	28/07/2010	111	2599	Supplementary testing
		BAnz.	15/12/2010	190	4177	Supplementary testing
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 4): - Comments on supplementary testing
		BAnz.	05/03/2013	B11	3	- Supplementary testing
Delta 65-3	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4177	Supplementary testing relating to the notification of the Federal Environmental Agency dated 22 April 2004 (BAnz. p. 10743, chapter I, no. 2.3).
		BAnz.	29/07/2011	113	2728	II, 1. Notification (no. 1): - Comment on supplementary testing
Delta 2000 CD-2	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4177	Supplementary testing relating to the circular from the Federal Environment Ministry dated 29 April 1999 – IG I3 – 51134/1 (JMG p. 448, no. 1.6.
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 2): - Comment on supplementary testing
ecom CN	rbr Meesstechnik GmbH, Iserlohn	BAnz.	15/12/2010	190	4177	Supplementary testing relating to the notification of the Federal Environmental Agency

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
						dated 30 Sept. 2004 (*BAnz.* p. 22 514, chapter I no. 2.3).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 3): - Comment on supplementary testing
ecom EN	rbr Meesstechnik GmbH, Iserlohn	BAnz.	15/12/2010	190	4178	Supplementary testing relating to the circular from the Federal Environment Ministry dated 17 April 2000 - IG I3 – 51134/1 (JMG. p. 445, no.1.3).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 5): - Comments on supplementary testing
ecom J2KN	rbr Meesstechnik GmbH, Iserlohn	BAnz.	15/12/2010	190	4178	Supplementary testing relating to the notification of the Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 556, chapter I, no. 1.3).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 6): - Comments on supplementary testing
ecom JN	rbr Meesstechnik GmbH, Iserlohn	BAnz.	15/12/2010	190	4178	Supplementary testing relating to the circular from the Federal Environment Ministry dated 06/10/1999 - IG I3 – 51134/1 (JMG. p. p. 722, no. 2.1).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 7): - Comments on supplementary

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
						testing
EM 200	Dräger Safety MSI GmbH, Hagen	BAnz.	15/12/2010	190	4178	Supplementary testing relating to the notification of the Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 556, chapter I, no. 1.1).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 8): - Comment on supplementary testing
Eurolyzer ST	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	15/12/2010	190	4179	
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 21): - Comment on supplementary testing
MSI 150 EURO 4	Dräger Safety MSI GmbH, Hagen	BAnz.	15/12/2010	190	4179	Supplementary testing relating to the circular from the Federal Environment Ministry dated 11/11/2002 - IG I3 – 51134/1 (JMG. p. p. 140, no. 3.2).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 9): - Comments on supplementary testing
MSI 150 PRO 2	Dräger Safety MSI GmbH, Hagen	BAnz.	15/12/2010	190	4179	Supplementary testing relating to the circular from the Federal Environment Ministrydated 11/11/2002 - IG I3 – 51134/1 (GMBl. p. p. 140, no. 3.1).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 10):

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
						- Comment on supplementary testing
MULTILYZER NG	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	15/12/2010	190	4179	
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 22): - Comments on supplementary testing
Nova 2000	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4180	Supplementary testing relating to the notification of the Federal Environmental Agency dated 6 Nov 2011 (BAnz. p. 7926, chapter I, no. 1.4).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 11): - Comments on supplementary testing
Spectra 2000 und Spectra 2000 – F	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4180	Supplementary testing relating to the notification of the Federal Environmental Agency dated 23 Sep 2007 (BAnz. p. 7926, chapter I, no. 1.5).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 12): - Comment on supplementary testing
Spectra Plus	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4180	
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 23): - Comment on supplementary testing

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
		BAnz.	02/03/2012	36	932	Supplementary testing
		BAnz.	23/07/2013	B5	6	II., 3. Notification: - Comments on the oxygen sensor and sensor replacement
testo 300 XL	Testo AG, Lenzkirch	BAnz.	15/12/2010	190	4181	Supplementary testing relating to the notification of the Federal Environmental Agency dated 17 Oct 2003 (BAnz. p. 23998, chapter I, no. 2).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 13): - Comments on supplementary testing
testo 327-2 und testo 327-2LL	Testo AG, Lenzkirch	BAnz.	15/12/2010	190	4181	Supplementary testing relating to the notification of the Federal Environmental Agency dated 23 Sep 2007 (BAnz. p. 7926, chapter I no.1.6 and 1.7).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 14): - Comment on supplementary testing
testo 330-2 LL	Testo AG, Lenzkirch	BAnz.	15/12/2010	190	4181	Supplementary testing relating to the notification of the Federal Environmental Agency dated 12 Sep 2006 (BAnz. p. 6717, chapter I, no. 1.8).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 15): - Comments on supplementary testing

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
testo 330-2LL/F		BAnz.	02/03/2012	36	933	Supplementary testing
		BAnz.	23/07/2013	B5	6	II., 1. Notification: - Comment on the oxygen sensor
testo 330-2 LL V2010	Testo AG, Lenzkirch	BAnz.	15/12/2010	190	4181	
		BAnz.	29/07/2011	113	2730	Supplementary testing
		BAnz.	29/07/2011	113	2733	II, 1. Notification (no. 24): - Comment on supplementary testing
testo 330-2 and testo 330-3	Testo AG, Lenzkirch	BAnz.	15/12/2010	190	4182	Supplementary testing relating to the notification of the Federal Environmental Agency dated 12 Sep 2006 (BAnz. p. 6717, chapter I, no. 1.2).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 16): - Comment on supplementary testing
Wöhler A97	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	15/12/2010	190	4182	Supplementary testing relating to the circular from the Federal Environment Ministry dated 09/07/1997 – IG I3 – 51134/1 (JMG. p. p. 466, no. 2.1).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 17): - Comment on supplementary testing
Wöhler A400	Wöhler Messgeräte Kehrgeräte GmbH, Bad	BAnz.	15/12/2010	190	4182	Supplementary testing relating to the notification of the

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
	Wünnenberg					Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 556, chapter I, no. 1.5).
		BAnz.	29/07/2011	113	2730	Supplementary testing
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 18): - Comment on supplementary testing
Wöhler A500	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	15/12/2010	190	4182	Supplementary testing relating to the notification of the Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 556, chapter I, no. 1.6).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 19): - Comment on supplementary testing
Wöhler A600	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	15/12/2010	190	4183	Supplementary testing relating to the notification of the Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 556, chapter I, no. 1.8).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 20): - Comment on supplementary testing
Brigon 500-3	Brigon Messtechnik GmbH & Co. KG, Rodgau	BAnz.	29/07/2011	113	2728	Supplementary testing relating to the notification of the Federal Environmental Agency dated 14 Feb 2008 (BAnz. p. 903, chapter I, no. 1.4).

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
BRIGOVISION I	Brigon Messtechnik GmbH & Co. KG, Rodgau	BAnz.	29/07/2011	113	2729	Supplementary testing relating to the circular from the Federal Environment Ministry dated 29 Apr 1999 – IG I 3 – 51134/1 – (JMG p. 448, no. 1.1).
BRIGOVISION II	Brigon Messtechnik GmbH & Co. KG, Rodgau	BAnz.	29/07/2011	113	2729	Supplementary testing relating to the notification of the Federal Environmental Agency dated 30 Mar 2004 (BAnz. p. 9221, chapter I, no. 1.3).
Delta 65-4	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	29/07/2011	113	2729	
PROGRESS	S + G Messtechnik GmbH, Ludwigshafen	BAnz.	29/07/2011	113	2729	Supplementary testing relating to the circular from the Federal Environment Ministry dated 11 Nov 2002 - IG I3 – 51134/1 (JMG p. 140, Notification).
Chemist 400	Seitron s. r. l., Bassano Del Grappa, Italien	BAnz.	20/07/2012	B12	1	
Casper 200	Seitron s. r. l., Bassano Del Grappa, Italy	BAnz.	05/03/2013	B11	1	
testo 320	Testo AG, Lenzkirch	BAnz.	05/03/2013	B11	2	

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
		BAnz.	23/07/2013	B5	6	II., 2. Notification: - Comment on the oxygen sensor
Bluelyzer ST	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	05/03/2013	B11	2	only determines stack gas heat loss
Wöhler A550	Wöhler Messgeräte und Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	23/07/2013	B5	1	
		BAnz.	01/04/2014	B13	4	Supplementary testing
Ecom B	rbr Meesstechnik GmbH, Iserlohn	BAnz.	23/07/2013	B5	1	
Brigon 505	BRIGON MESSTECHNIK GmbH & Co. KG, Rodgau	BAnz.	23/07/2013	B5	2	
NOVAPlus	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	23/07/2013	B5	3	
MULTILYZER ST	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	23/07/2013	B5	4	
ECOM CL	rbr Meesstechnik GmbH, Iserlohn	BAnz.	01/04/2014	B13	1	

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
BRIGON 505+	BRIGON MESSTECHNIK GmbH & Co. KG, Rodgau	BAnz.	01/04/2014	B13	2	

Measuring systems for monitoring CO limit values and determining waste gas components at combustion installations fired by solid fuels

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Ecom-EN2	rbr Meesstechnik GmbH, Iserlohn	BAnz.	28/07/2010	111	2599	Supplementary testing relating to the notification of the Federal Environmental Agency dated 25 Jan 2010 (BAnz. p. 557).
		BAnz.	15/12/2010	190	4177	Supplementary testing
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 4): - Comment on supplementary testing
		BAnz.	05/03/2013	B11	3	Supplementary testing
Eurolyzer ST	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	15/12/2010	190	4179	Performance testing
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 21): - Comment on supplementary testing
MULTILYZER NG	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	15/12/2010	190	4179	
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 22): - Comment on supplementary testing

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Spectra 2000 – F	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	15/12/2010	190	4180	Supplementary testing relating to the notification of the Federal Environmental Agency dated 23 Sep 2007 (BAnz. p. 7926, chapter I, no. 1.5).
		BAnz.	29/07/2011	113	2731	II, 1. Notification (no. 12): - Comment on supplementary testing
testo 330-2 LL V2010	Testo AG, Lenzkirch	BAnz.	29/07/2011	113	2730	Supplementary testing relating to the notification of the Federal Environmental Agency dated 2 Dec 2010 (BAnz. p. 4177, chapter I no. 1.19).
		BAnz.	29/07/2011	113	2733	II, 1. Notification (no. 24): - Comment on supplementary testing
Wöhler A400	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	29/07/2011	113	2730	Supplementary testing relating to the notification of the Federal Environmental Agency dated 2 Dec 2010 (BAnz. p. 4177, chapter I no. 1.22).
		BAnz.	29/07/2011	113	2732	II, 1. Notification (no. 18): - Comment on supplementary testing
Spectra Plus	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	02/03/2012	36	932	Supplementary testing relating to the notification of the Federal Environmental Agency dated 2 Dec 2010 (BAnz. p. 4177, chapter I no. 1.15) and of

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
						15 Jul 2011 (BAnz. p. 2728, chapter II 1. Notification (no. 23)).
		BAnz.	23/07/2013	B6	6	II., 3. Notification: - Comments on the oxygen sensor and sensor replacement
Testo 330-2LL/F	Testo AG, Lenzkirch	BAnz.	02/03/2012	36	933	Supplementary testing relating to the notification of the Federal Environmental Agency dated 2 Dec 2010 (BAnz. p. 4177, chapter I no. 1.18) and of 15 Jul 2011 (BAnz. p. 2718, chapter II 1. Notification (no. 15)).
		BAnz.	23/07/2013	B5	6	II., 1. Notification: - Comment on the oxygen sensor
Testo 350 V2010	Testo AG, Lenzkirch	BAnz.	02/03/2012	36	933	
MULTILYZER ST	Systronik Elektronik und Systemtechnik GmbH, Illmensee	BAnz.	23/07/2013	B5	4	
BRIGON 505+	BRIGON MESSTECHNIK GmbH & Co. KG, Rodgau	BAnz.	01/04/2014	B13	2	

Measuring systems for monitoring dust and CO limit values and for determining the waste gas component O_2 at combustion installations firing solid fuels

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Wöhler SM500	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	20/07/2012	B12	1	
		BAnz.	05/03/2013	B11	4	Supplementary testing
		BAnz.	01/04/2014	B13	5	II., 2. Notification: - Comment on the field of application
		BAnz.	01/04/2014	B13	5	III., 1. Correction - Correction of the notification on the dust monitoring system
PM measuring set	Vereta GmbH, Einbeck	BAnz.	14/11/2012	B8	1	Oxygen and carbon monoxide concentrations are to be determined simultaneously using suitable technical equipment.
		BAnz.	05/03/2013	B11	5	Supplementary testing
		BAnz.	01/04/2014	B13	5	II., 3. Notification: - Comment on the field of application
testo 380	Testo AG, Lenzkirch	BAnz.	05/03/2013	B11	4	
		BAnz.	23/07/2013	B5	5	Supplementary testing
		BAnz.	01/04/2014	B13	5	II., 1. Notification: - Comment on the field of application
STM 225 combined with	Afriso-Euro-Index	BAnz.	23/07/2013	B5	4	

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Multilyzer NG/Eurolyzer ST	GmbH, Güglingen	BAnz.	01/04/2014	B13	2	Supplementary testing
PM measuring system FSM	MRU GmbH, Neckarsulm-Obereisesheim	BAnz.	01/04/2014	B13		

Measuring devices determining the moisture content of wood in accordance with Art. 3 (3) of the 1st BImSchV

Type/instrument	Manufacturer	Publication	Date	Number	Page	Comments
Wöhler A550	Wöhler Messgeräte Kehrgeräte GmbH, Bad Wünnenberg	BAnz.	01/04/2014	B13	4	Supplementary testing

9 Glossary

Flue gas loss (1st BImSchV):

Difference between the heat of the waste gas and the heat of the combustion air as a percentage of the calorific value of the combustion material.

Accreditation:

Official recognition of a body's competence (i.e. of a test body) to perform certain tasks (i.e. performance testing). Accreditation is granted by the national accreditation body (for Germany this is DAKKS) if specific requirements are fulfilled.

Response time (VDI 4206 part 1):

Elapsed time between a step change of the measured variable at the instrument's inlet and the time at which the measured signal reaches a fixed reading of 90 % of the final stable reading for the change.

Existing firing installations (1st BImSchV):

Combustion installations established prior to 22 March 2010.

Reference value:

Variable fixed in the regulation (i.e. oxygen content) which is necessary to convert the measured variable to the reference conditions (reference oxygen content).

Declaration of suitability (VDI 4203 part 1):

Administrative act for confirming the suitability of the measuring system for monitoring tasks in the area controlled by law. The declaration is made by publication in the Federal Gazette.

Performance-tested measuring device (VDI 4208 part 2):

Measuring device proven suitable for a defined measurement objective in a performance test.

Performance test (VDI 4206 part 1):

Experimental demonstration that a measuring device used for monitoring emissions complies with the specified performance criteria for the intended application, taking into account the appropriate test procedures.

Small single room firing installation (1st BImSchV):

Combustion installation which is primarily used to heat the room in which it is installed as well as cookers with and without indirectly heated baking facilities.

Emissions (1st BImSchV):

Air pollutants emitted by a combustion installation; concentrations refer to the waste gas volume under standard conditions (273 Kelvin, 1013 Hectopascal) after deducing the moisture content of water vapour.

Particulate matter:

Consist of a complex mixture of solid and liquid particles and is divided into different fractions depending on their size. A difference is made between PM_{10} with a maximum diameter of 10 µm, $PM_{2,5}$ and ultra-fine particles with a diameter of less than 0.1µm.

Fire place certificate:

Payable certificate issued by the chimney sweep after the fireplace inspection or on the occasion of any other tasks carried out by the chimney sweep. The fireplace certificate contains relevant information to ensure operational safety and fire protection.

Firing installation (1st BImSchV):

Installation which fires fuels to generate heat; this includes fire places and, where applicable, devices for supplying combustion air, connections and flue gas devices.

Thermal fixing capacity (1st BImSchV):

Heat content of the fuel which can be fed to a continuously operating combustion installation per unit of time divided by the lower calorific value.

Basic furnace (1st BImSchV):

Small residential combustion installation serving as heat storage furnace consisting of mineral storage materials, which are installed on-site by a qualified mechanic.

Air pollution (Federal Immission Control Act):

Air pollutants, noise, vibration, light, heat, radiation and similar environmental phenomena affecting humans, animals, plants, soil, water, atmosphere as well as cultural and other material assets.

Core flow (1st BImSchV):

Portion of the waste gas flow in the cross-section of the duct with the highest temperature in the measurement port.

Small firing installations:

Firing installations as defined in the 1st BImSchV with a thermal fixing capacity below 10 MW.

Measuring device:

Totality of all devices and components of a measuring method necessary to obtain a measured value. The measuring system also comprises devices for sampling (e.g. probe, sample gas lines), sample treatment and data output. The term measuring device is used in the 1st BImSchV.

Measuring device testing body (VDI 4208 part 2):

Body performing periodic testing of performance tested measuring devices for emission measurements at small firing installations according to 1st BImSchV or KÜO.

Measurand:

Specific parameter, which is the object of a measurement. The measurand is a qualifying characteristic of the stack gas, for example the mass concentration of a measured component (e.g. dust), the temperature or the oxygen content.

Measurement hole:

Opening in the waste gas duct along the measurement line.

Test programme:

Totality of measurements / tests to be performed at an installation.

Performance criterion:

Technical parameter and formal requirements stipulated in the legal provisions applying to measuring systems intended for monitoring measurements in the regulated areas.

Medium firing installation:

Combustion installations as defined in the 1st BImSchV with a thermal fixing capacity between 10 MW and 20 MW.

Nominal heat output (1st BImSchV):

Maximum heat quantity supplied per unit of time by the combustion installation in continuous operation; where a combustion installation has been adjusted to a nominal heat output range, the nominal heat output is the fixed maximum usable heat output within the nominal heat output range which is indicated on an additional plate; without an additional plate, the maximum value of the nominal heat output range is used as the nominal heat output.

New installations:

Combustion installation which has been installed since 22 March 2010.

Oil derivatives (1st BImSchV):

Non-volatile organic substances which gather on the filter paper during the determination of the smoke number.

Open fireplace (1st BImSchV):

Fireplace burning solid fuels which may be operated openly in accordance with applicable provisions unless the fireplace is intended for the exclusive purpose of preparing food.

Test specimen:

Product supplied by the manufacturer for the purpose of performance or type testing.

Nitrogen oxides:

Nitrogen monoxide and nitrogen dioxide expressed as nitrogen dioxide.

Combustion air temperature:

Temperature of the air supplied to the burner.

Significant changes (1st BImSchV):

Changes to a combustion installation which might considerably modify the type and quantity of emissions. A significant change is assumed in the following situations:

a) Conversion of the combustion installation to allow for an alternative fuel unless the installation is designed to be fired with different fuels;

b) Replacement of a boiler.

10 List of references

[1] Dipl.-Ing. Hans-Peter Ewens - Proceedings of the Expert Forum KRdL operation of small-scale biomass combustion plants -Environmental and safety aspects

[2] Manual on Emission Monitoring at Installations which do not Require Official Approval within the Scope of the 1st Federal Immission Control Ordinance (1st BImSchV), November 1997

Legal and Administrative Provisions

[3] Act on the prevention of harmful effects on the environment caused by air pollution, noise, vibration and similar phenomena (Federal Pollution Control Act - BImSchG) dated 26 September 2002 (BGBl. I p. 3830)

[4] First ordinance for the implementation of the German Immission Control Act (ordinance on small and medium firing installations – 1st BImSchV) dated 26 January 2010 (BGBl. I, p. 38) entered into force on 22 March 2010

[5] Thirty-ninth ordinance for the implementation of the German Immission Control Act (Ordinance on air quality standards and maximum emissions – 39th Federal Immission Control Act (39th BImSchV)

[6] Uniform Practice in monitoring emissions from small firing installations pursuant to the first ordinance for the implementation of the German Immission Control Act (ordinance on small and medium firing installations – 1st BImSchV) here: Amendment of the guidelines on minimum requirements for measuring systems during performance testing by VDI guidelines – Circular from the Federal Environment Ministry dated 12 December 2011 – IG I 2 – 51134/0

[7] Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

[8] Directive 2008/50/EC of the European Parliament and the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[9] Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products

[10] 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

[11] Ordinance on sweeping and monitoring installations (German Chimney sweep and monitoring ordinances [Kehr- und Überprüfungsordnung – KÜO]) of 16 June 2009 amended by article 1 of the ordinance dated 14 June 2011 (BGBl. I p. 1077)

Standards and Guidelines

[12] ISO/IEC 17025: August 2005
General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025: 2005)

[13] VDI 4203 part 3: September 2010
Test procedures for point-related ambient air measuring systems for gaseous and particulate air pollutants

[14] VDI 4206 part 1: August 2010
Performance criteria and test procedures for measuring devices for monitoring emissions at small firing installations - Measuring devices for the determination of gaseous emissions and flue gas parameters

[15] VDI 4206 part 2: June 2011
Performance criteria and test procedures for measuring devices for monitoring emissions at small firing installations – Measuring devices for the determination of particulate emissions

[16] VDI 4206 part 3: August 2010
Performance criteria and test procedures for measuring devices for monitoring emissions at small firing installations - Measuring devices for the determination of smoke number

[17] VDI 4206 part 4: August 2013
Performance criteria and test procedures for measuring devices for monitoring emissions at small firing installations - Measuring devices for the determination of moisture of lumpy wood

[18] VDI 4208 part 1: February 2012
Requirements on bodies for emission monitoring at small firing installations - Bodies for the determination of emissions

[19] VDI 4208 part 2: September 2010
Requirements on bodies for emission monitoring at small firing installations - Bodies for periodic testing of performance-tested measuring devices

[20] VDI 2066 part 1: November 2006
Particulate matter measurement - Dust measurement in flowing gases Gravimetric determination of dust load

[21] EN 13240, October 2005
Roomheaters fired by solid fuel - Requirements and test methods; German edition EN 13240: 2001 + A2: 2004

[22] DIN EN 13240 Corrigendum 1, June 2008
Roomheaters fired by solid fuels – Requirements and tests; German edition EN 13240: 2001 + A2: 2004, corrigendum of DIN EN 13240: 2005-10: German edition EN 13240: 2001/AC:2006 and EN 13240:2001/A2:2 004/AC: 2007

[23] EN 15250, June 2007
EN 15250 Slow heat release appliances fired by solid fuel - Requirements and test methods; German edition: EN 15250: 2007

[24] EN 13229, October 2005
Inset appliances including open fires fired by solid fuels - Requirements and test methods; German edition: EN 13229: 2001 + A1: 2003 + A2: 2004

[25] DIN EN 13229 Corrigendum 1, June 2008
Inset appliances including open fires fired by solid fuels – Requirements and test methods; German edition EN 13229: 2001 + A1: 2003 + A2: 2004, corrigendum of DIN EN 13229:2005-10: German edition EN 13229: 2001/AC: 2006 and EN 13229: 2001/A2: 2004/AC: 2007

[26] EN 12815, June 2001
Residential cookers fired by solid fuels - Requirements and test methods
German edition: EN 12815: 2001 + A1: 2004

[27] EN 14785, June 2006
Residential space heating appliances fired by wood pellets - Requirements and test methods, German edition: EN 14785: 2006

[28] DIN 51603-1, September 2011
Liquid fuels - Fuel oils - Part 1: Fuel oils EL, specifications

[29] DIN 51402-1, October1986
Testing of flue gases of oil burning systems

[30] DIN 51402-2, March 1979
Determination of flue gases of oil burning systems; method by fluid means for detection of oil derivatives

Annex 1 List of Measuring device testing bodies

Bodies for the periodic testing of performance-tested measuring devices for use at small firing installations in accordance with Art. 13 para. 3 of the 1st BImSchV (dated October 2013, this list is not exhaustive).

Table 20: List of Measuring device testing bodies

Measuring device testing body	Address	Competent authority
Schornsteinfeger-Innung für den Regierungsbezirk Düsseldorf Technische Prüfstelle	Weinheimer Str. 27 40229 Düsseldorf	Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen Essen
Schornsteinfeger-Innung für den Regierungsbezirk Arnsberg Technische Prüfstelle	Langer Brauck 1 58640 Iserlohn	
Schornsteinfeger-Innung für den Kammerbezirk Köln Technische Prüfstelle	Genkerstr. 8 53842 Troisdorf	
Schornsteinfeger-Innung Ostwestfalen-Lippe	Sperlingstr. 24 33607 Bielefeld	
Schornsteinfegerinnung für den Handwerkskammerbezirk Aachen Technische Prüfstelle	An der Hüls 199 48249 Dülmen	
Schornsteinfegerinnung für den Regierungsbezirk Münster Technische Prüfstelle	Alter Ostdamm 17 48249 Dülmen	
Schornsteinfeger-Innung Berlin	Westfälische Str.87 10709 Berlin	Senatsverwaltung für Gesundheit, Umwelt und Verbraucherschutz Berlin
RED Riesaer Energiedienst GbR	Hauptstr. 26 01589 Riesa	Sächsisches Landesamt für Umwelt und Geologie Dresden
Landesinnungsverband des Schornsteinfegerhandwerks Sachsen, Prüfstand für Schornsteinfeger Messeinrich-tungen	Pirnaer Landstr. 40 01237 Dresden ***Standort des Messeinrichtungen-Prüfstands*** Wöllnauer Chaussee 8 04838 Doberschütz/Rote Jahne	
Landesinnungsverband des Schornsteinfegerhandwerks Sachsen Prüfstand für Schornstein-feger Messeinrichtungen	Pirnaer Landstr. 40 01237 Dresden	
Technische Prüfstelle der Schornsteinfegerinnung Hamburg	Osterrade 19, 21031 Hamburg	Institut für Hygiene und Umwelt Hamburg
Schornsteinfeger-Innung für das Land Baden-Württemberg		Ministerium für Umwelt, Naturschutz und Verkehr Baden-Württemberg Stuttgart
Technische Prüfstelle der Schornsteinfegerinnung Hannover e. V.	Mannheimer Str. 14 30880 Laatzen	Staatliches Gewerbeaufsichtsamt Hildesheim
Prüfstandsgesellschaft mbH mit **7 Außenstellen** **Braunschweig**, Goethestr. 6, 38122 Braunschweig	Konrad-Adenauer-Str. 7 30853 Langenhagen	

Measuring device testing body	Address	Competent authority
Lüneburger Heide, Georg-Leppien-Str. 20, 21337 Lüneburg **Oldenburg**, Tannenstr. 9-11, 26122 Oldenburg **Osnabrück-Emsland**, Hollensteder Str. 11, 49584 Früstenau **Ostfriesland**, Straße des Handwerks 2, 26603 Aurich **Stade**, Hansestr. 26, 21682 Stade **Süd-Niedersachsen**, Blücherstr. 14, 31061 Alfeld/Leine		
Messgeräteprüfstelle Kleinschmidt GmbH	Stockholmer Str. 5 29640 Schneverdingen	
Prüfstand Sachsen-Anhalt UG	Gießerstr. 8 06116 Halle/Saale	Landesamt für Umweltschutz Sachsen-Anhalt Postfach 200841 06009 Halle (Saale)
Messgeräteprüfstelle – Prüfung/Kalibrierung von Messgeräten für Schornsteinfegertätigkeiten Buchholz/Voigt GbR	Feld am Bruche 8 39135 Egeln	
Schornsteinfeger-Innung	Kahler Allee 37 66386 St. Ingbert	Landesamt für Umwelt- und Arbeitsschutz Saarbrücken
Schornsteinfegerinnung im Freistaat Thüringen	Weimarische Str. 62 a 99429 Nohra OT Utzberg	Landratsamt Weimarer Land Untere Immissions-schutzbehörde Apolda
Technische Prüfstelle des Schornsteinfegerhandwerks für die Pfalz und Rheinhessen e. V.	Im Stadtwald 15a 67663 Kaiserslautern	Landesamt für Umwelt, Wasserwirtschaft und Gewerbeaufsicht Mainz
Technische Prüfstelle der Schornsteinfegerinnung Trier	Loebstraße 18 54292 Trier	
TPV Koblenz Montabaur Technische Prüf- und Vertriebsstelle für das Schornsteinfegerhandwerk GmbH	Hoevelstraße 19 56073 Koblenz	
Märkische Kiefer eG Technische Prüfstelle	Eschenallee 33 14974 Ludwigsfelde	Landesamt für Umwelt, Gesundheit und Verbraucherschutz Abt. Technischer Umweltschutz Potsdam
Schornsteinfegerinnung Lübeck Körperschaft des öffentlichen Rechts	Krummredder 13 24539 Neumünster	Ministerium für Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein Kiel
Kaminkehrerinnung Oberbayern Messeinrichtungenprüfstelle	Gneisenaustr. 12 80992 München	Bayrisches Landesamt für Umwelt
Kaminkehrer-Innung Niederbayern Messeinrichtungenprüfstelle	Wengerstr. 13 – 17 84164 Moosthenning	
Kaminkehrerinnung Schwaben Messeinrichtungenprüfstelle	Siebentischstr. 56 86161 Augsburg	
Schornsteinfeger-Innung Mittelfranken	Lechnerstr. 6	

Measuring device testing body	Address	Competent authority
Messeinrichtungenprüfstelle	90482 Nürnberg	
Kaminkehrer-Innung Oberpfalz Messeinrichtungenprüfstelle	St.-Florian-Str. 1 92345 Dietfurt-Mühlbach	
Kaminkehrerinnung Oberfranken Messeinrichtungenprüfstelle	Christensenstr. 2 95463 Bindlach	
Kaminkehrer-Innung Unterfranken Messeinrichtungenprüfstelle	Kirchplatz 3 97228 Rottendorf	
Messeinrichtungenprüfstelle der Schornsteinfeger-Innung Mecklenburg-Vorpommern	An der Molkerei 1 19198 Kritzmow OT Klein Schwaß	Landesamt für Umwelt, Naturschutz und Geologie
Messeinrichtungenprüfstelle Langen GmbH	Heinrich-Hertz-Str. 20 63225 Langen	Hessisches Landesamt für Umwelt und Geologie
MPRM Messeinrichtungenprüfstelle Rhein-Main GmbH	Intzestr 8 – 10 60314 Frankfurt am Main	
Technische Prüfstelle für Mess- und Prüfgeräte für Schornsteinfeger und Marktpartner Nordhessen UG	Zum Vockenberg 2 34302 Guxhagen	
Schornsteinfeger-Innung Freiburg	Ahornweg 18 79822 Titisee-Neustadt	Ministerium für Umwelt, Naturschutz und Verkehr Baden-Württemberg
Schornsteinfeger-Innung Karlsruhe	Rüppurrer Straße 13 76137 Karlsruhe	
Schornsteinfegerinnung Stuttgart	Steinbeisstraße 9 71332 Waiblingen	
Schornsteinfegerinnung Tübingen	Robert-Bosch-Straße 28 88499 Riedlingen	

Annex 2 Forms provided by the Federal Association of the Chimney Sweep Craft [Bundesverband des Schornsteinfegerhandwerks –Zentralinnungsverband ZIV] taken from the working paper no. 601 (preliminary version)

Formblatt für die Bescheinigung für neu errichtete oder wesentlich geänderte Einzelraumfeuerungsanlagen für feste Brennstoffe

Anschrift und Reg.-Nr. des Schornsteinfegerbetriebes	Datum:
	☐ Überprüfung nach § 14 Abs. 1 ☐ Überprüfung nach § 14 Abs. 2 ☐ Wiederholungs-Überprüfung nach § 14 Abs. 5 ☐ Beratung nach § 4 Abs. 8
	Ausfertigung für den
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung	über das Ergebnis der Überprüfung und Beratung für eine Feuerungsanlage für feste Brennstoffe gemäß der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38)

Feuerstätte: Hersteller, Typ, Herstell-Nr.	Datum auf dem Typenschild	Datum/Jahr der Errichtung	Nennwärmeleistung kW
Feuerstättenbauart nach Anlage 4	Beschickungsart	Art der Anlage	
Eingesetzte Brennstoffe nach § 3 Absatz 1 (Nr.)			

☐ Positive Prüfbescheinigung liegt vor (§ 4 Abs. 3 oder Abs. 5 Nr. 2)
☐ Messung durch eine Schornsteinfegerin oder Schornsteinfeger positiv (§ 4 Abs. 5 Nr. 1)
☐ Einrichtung zur Reduzierung der Staubemissionen vorhanden (§ 4 Abs. 5)

Ordnungsgemäßer technischer Zustand der Feuerungsanlage (§ 4 Abs. 1):	☐ ja ☐ nein
Ableitbedingungen der Feuerungsanlage eingehalten (§ 19 Abs. 1):	☐ ja ☐ nein
Verwendete Brennstoffe nach Herstellerangabe (§ 4 Abs. 1) bzw. § 4 Abs. 4 geeignet:	☐ ja ☐ nein

☐ Das Ergebnis entspricht der Verordnung.

☐ Das Ergebnis entspricht **nicht** der Verordnung, weil ...

☐ Die Mängel sind zu beseitigen. Danach ist bis zum ..... eine Wiederholungsüberprüfung erforderlich. Geben Sie mir bitte Nachricht, sobald diese erfolgen kann (§ 14 Abs. 5).

Beratung wurde in folgenden Punkten durchgeführt (§ 4 Abs. 8, für handbeschickte Feuerungsanlagen)**:**	☐ **Feuchtegehalt im Brennstoff wurde gemessen** (§ 3 Abs. 3)**:**
☐ Sachgerechte Bedienung der Feuerungsanlage	Mittelwert: %
☐ Ordnungsgemäße Lagerung des Brennstoffes	Sofern der Feuchtegehalt 25 % oder mehr beträgt, ist der Brennstoff vor der Verwendung nachzutrocknen.
☐ Besonderheiten beim Umgang mit festen Brennstoffen	

Bemerkungen:

Datum Unterschrift des Schornsteinfegers	Diese Bescheinigung ist fristgerecht an den/die Bezirksschornsteinfegermeister/-meisterin zu senden (§ 20 Abs. 2) ☐ durch den Betreiber ☐ durch den Schornsteinfegerbetrieb.

Formblatt für die Bescheinigung für neu errichtete oder wesentlich geänderte Feuerungsanlagen für feste Brennstoffe, ausgenommen Einzelraumfeuerungsanlagen

Anschrift und Reg.-Nr. des Schornsteinfegerbetriebes	Datum:
	☐ Überprüfung nach § 14 Abs. 1 ☐ Überprüfung nach § 14 Abs. 2 ☐ Messung nach § 14 Abs. 2 ☐ Wiederholungs-Überprüfung od. Messung nach § 14 Abs. 5 ☐ Beratung nach § 4 Abs. 8
	Ausfertigung für den
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung	über das Ergebnis der Überprüfung, Messung und Beratung für eine Feuerungsanlage für feste Brennstoffe gemäß der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38)

Feuerstätte: Hersteller, Typ, Herstell-Nr.	Baujahr	Datum/Jahr der Errichtung	Nennwärmeleistung kW
Feuerstättenbauart	Beschickungsart	Art der Anlage	Brennstofffüllraumvolumen l
Eingesetzte Brennstoffe nach § 3 Absatz 1 (Nr.)		Wärmespeicher erforderlich ☐ ja ☐ nein	Wärmespeichervolumen l

Ordnungsgemäßer technischer Zustand der Feuerungsanlage (§ 4 Abs. 1):	☐ ja ☐ nein
Vorhandenes Wärmespeichervolumen ausreichend (§ 5 Abs. 4):	☐ ja ☐ nein
Ableitbedingungen der Feuerungsanlage eingehalten (§ 19 Abs. 1):	☐ ja ☐ nein
Verwendete Brennstoffe nach Herstellerangaben (§ 4 Abs. 1) bzw. § 5 Abs. 2 und 3 geeignet:	☐ ja ☐ nein

Messergebnis:

Staubgehalt g/m³	CO-Gehalt g/m³	Wärmeträgertemperatur °C	Sauerstoffgehalt im Abgas %
Grenzwerte + Messunsicherheiten (§ 5 Abs. 1 und Anlage 2 Nr. 2.3) g/m³	g/m³	Abgastemperatur °C	Druckdifferenz Pa

☐ Das Ergebnis entspricht der Verordnung.
☐ Das Ergebnis entspricht **nicht** der Verordnung, weil ...

☐ Die Mängel sind zu beseitigen. Danach ist bis zum ..... eine Wiederholungsüberprüfung und/oder -messung erforderlich. Geben Sie mir bitte Nachricht, sobald diese erfolgen kann (§ 15 Abs. 5).

Beratung wurde in folgenden Punkten durchgeführt (§ 4 Abs. 8, für handbeschickte Feuerungsanlagen)**:**	☐ **Feuchtegehalt im Brennstoff wurde gemessen** (§ 3 Abs. 3)**:**
☐ Sachgerechte Bedienung der Feuerungsanlage	Mittelwert: %
☐ Ordnungsgemäße Lagerung des Brennstoffes	Sofern der Feuchtegehalt 25 % oder mehr beträgt, ist der Brennstoff vor der Verwendung nachzutrocknen.
☐ Besonderheiten beim Umgang mit festen Brennstoffen	

Bemerkungen:

Datum Unterschrift des Schornsteinfegers	Diese Bescheinigung ist fristgerecht an den/die Bezirksschornsteinfegermeister/-meisterin zu senden (§ 20 Abs. 2) ☐ durch den Betreiber ☐ durch den Schornsteinfegerbetrieb.

Formblatt für die Bescheinigung für bestehende Einzelraumfeuerungsanlagen für feste Brennstoffe

Anschrift und Reg.-Nr. des Schornsteinfegerbetriebes	Datum: ☐ Überprüfung nach § 15 Abs. 2 ☐ Feststellung nach § 26 Abs. 5 ☐ Wiederholungs-Überprüfung nach § 15 Abs. 5 ☐ Beratung nach § 26 Abs. 7 Ausfertigung für den
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung	über das Ergebnis der Überprüfung, Feststellung und Beratung an einer Feuerungsanlage für feste Brennstoffe gemäß der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38)

Feuerstätte: Hersteller, Typ, Herstell-Nr.	Datum auf dem Typenschild	Datum der Herstellung oder Errichtung	Nennwärmeleistung kW
Feuerstättenbauart	Beschickungsart	Art der Anlage	
Eingesetzte Brennstoffe nach § 3 Absatz 1 (Nr.)			

Ordnungsgemäßer technischer Zustand der Feuerungsanlage (§ 4 Abs. 1):	☐ ja ☐ nein
Verwendete Brennstoffe nach Herstellerangabe geeignet (§ 4 Abs. 1):	☐ ja ☐ nein

☐ Das Ergebnis entspricht der Verordnung.

☐ Das Ergebnis entspricht **nicht** der Verordnung, weil ...

☐ Die Mängel sind zu beseitigen. Danach ist bis zum ..... eine Wiederholungsüberprüfung erforderlich. Geben Sie mir bitte Nachricht, sobald diese erfolgen kann (§ 15 Abs. 5).

☐ Positive Prüfstandsmessbescheinigung des Herstellers liegt vor (§ 26 Abs. 1)	
☐ Messung durch eine Schornsteinfegerin oder Schornsteinfeger positiv (§ 26 Abs. 1)	
☐ Nachrüstung der Einrichtung zur Reduzierung der Staubemissionen ist erfolgt (§ 26 Abs. 2)	
☐ Anlage ohne Nachrüstverpflichtung (§ 26 Abs. 3)	
☐ Außerbetriebnahme oder Nachrüstung erforderlich bis (§ 26 Abs. 2)	
☐ Nachrüstung erforderlich bis (§ 26 Abs. 4)	

Beratung wurde in folgenden Punkten durchgeführt (§ 4 Abs. 8, für handbeschickte Feuerungsanlagen)**:**	☐ **Feuchtegehalt im Brennstoff wurde gemessen** (§ 3 Abs. 3)**:**
☐ Sachgerechte Bedienung der Feuerungsanlage	Mittelwert: %
☐ Ordnungsgemäße Lagerung des Brennstoffes	Sofern der Feuchtegehalt 25 % oder mehr beträgt, ist der Brennstoff vor der Verwendung nachzutrocknen.
☐ Besonderheiten beim Umgang mit festen Brennstoffen	

Bemerkungen:

Datum Unterschrift des Schornsteinfegers	Diese Bescheinigung ist fristgerecht an den/die Bezirksschornsteinfegermeister/-meisterin zu senden (§ 20 Abs. 2) ☐ durch den Betreiber ☐ durch den Schornsteinfegerbetrieb.

Formblatt für die Bescheinigung für bestehende Feuerungsanlagen für feste Brennstoffe, ausgenommen Einzelraumfeuerungsanlagen

Anschrift und Reg.-Nr. des Schornsteinfegerbetriebes	Datum: ☐ Messung und Überprüfung nach § 15 Abs. 1 ☐ Messung und Überprüfung nach § 25 Abs. 4 ☐ Wiederholungs-Überprüfung od. Messung nach § 15 Abs. 5 ☐ Beratung nach § 25 Abs. 5 Ausfertigung für den
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung über das Ergebnis der Überprüfung, Messung und Beratung für eine Feuerungsanlage für feste Brennstoffe gemäß der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38)

Feuerstätte: Hersteller, Typ, Herstell-Nr.	Baujahr	Datum/Jahr der Errichtung	Nennwärmeleistung kW
Feuerstättenbauart	Beschickungsart	Art der Anlage	Teillastmessung ☐ ja ☐ nein
Eingesetzte Brennstoffe nach § 3 Absatz 1 (Nr.)		Wärmespeicher vorhanden ☐ ja ☐ nein	Wärmespeichervolumen l

Ordnungsgemäßer technischer Zustand der Feuerungsanlage (§ 4 Abs. 1):	☐ ja ☐ nein
Verwendete Brennstoffe nach Herstellerangaben (§ 4 Abs. 1) und § 5 Abs. 2 und 3 geeignet:	☐ ja ☐ nein

Messergebnis:

Staubgehalt g/m³	CO-Gehalt g/m³	Wärmeträgertemperatur °C	Sauerstoffgehalt im Abgas %
Grenzwerte + Messunsicherheiten (§5 Abs.1/§ 25 Abs.2 u. Anl. Nr.2.3) g/m³	g/m³	Abgastemperatur °C	Druckdifferenz Pa

☐ Das Ergebnis entspricht der Verordnung.

☐ Das Ergebnis entspricht nicht der Verordnung, weil ...

☐ Die Mängel sind zu beseitigen. Danach ist bis zum ..... eine Wiederholungsüberprüfung und/oder -messung erforderlich. Geben Sie mir bitte Nachricht, sobald diese erfolgen kann (§ 15 Abs. 5).

Grenzwerte der Stufe 1 (Staubgehalt g/m³, CO-Gehalt g/m³) einzuhalten ab: (§ 5 Abs. 1, § 25 Abs. 1)

Beratung wurde in folgenden Punkten durchgeführt (§ 4 Abs. 8, für handbeschickte Feuerungsanlagen):	☐ Feuchtegehalt im Brennstoff wurde gemessen (§ 3 Abs. 3):
☐ Sachgerechte Bedienung der Feuerungsanlage	Mittelwert: %
☐ Ordnungsgemäße Lagerung des Brennstoffes	Sofern der Feuchtegehalt 25 % oder mehr beträgt, ist der Brennstoff vor der Verwendung nachzutrocknen.
☐ Besonderheiten beim Umgang mit festen Brennstoffen	

Bemerkungen:

Datum Unterschrift des Schornsteinfegers	Diese Bescheinigung ist fristgerecht an den/die Bezirksschornsteinfegermeister/-meisterin zu senden (§ 20 Abs. 2) ☐ durch den Betreiber ☐ durch den Schornsteinfegerbetrieb.

Annex 3 Confirmation presented in annex 2 of the German Chimney sweep and monitoring ordinances [Kehr- und Überprüfungssordnung] of June 16, 2009

Formblatt

Name und Anschrift des Eigentümers/Verwalters	Bezirksnummer laut Feuerstättenbescheid:
	Datum des Feuerstättenbescheides:
	Objektnummer laut Feuerstättenbescheid:
Bezirksschornsteinfegermeister(in)	Liegenschaft:

Formblatt zum Nachweis der Durchführung von Schornsteinfegerarbeiten

(§ 4 Absatz 1 Schornsteinfeger-Handwerksgesetz – SchfHwG – vom 26. November 2008, BGBl. I S. 2242)

Folgende Anlagen sind nach der Verordnung über die Kehrung und Überprüfung von Anlagen (Kehr- und Überprüfungsordnung – KÜO) vom 16. Juni 2009 (BGBl. I S. 1292), nach Rechtsverordnungen nach § 1 Absatz 1 Satz 3 SchfHwG oder nach der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38) jeweils an dem angegebenen Datum gekehrt, überprüft oder überwacht worden:

Laut Feuerstättenbescheid Nr.	Anlage (Art/Standort oder Verweis auf Anhang)	Datum der Arbeits-ausführung	Mängel vorhanden ja/nein	Änderungsmitteilung/Bemerkungen (ggf. Verweis auf gesondertes Blatt)

Anschrift des Schornsteinfegerbetriebes	Die Schornsteinfegerarbeiten sind entsprechend dem Feuerstättenbescheid ordnungsgemäß durchgeführt worden.
Handwerkskammer, bei der die Anzeige nach § 8 EU/EWR Handwerk-Verordnung erstattet wurde:	Datum Unterschrift des Schornsteinfegers
Ausführender Schornsteinfeger (in Druckbuchstaben):	Bestätigung der Ausführung dieser Schornsteinfegerarbeiten
	Datum Unterschrift des Eigentümers/Verwalters

Gasförmige Brennstoffe

Anschrift des Schornsteinfegerbetriebes	Datum der Arbeitsausführung:
	☐ Überprüfung nach § 1 KÜO ☐ Wiederholungsmessung nach § 1 Absatz 2 KÜO ☐ Erstmessung nach § 14 Absatz 2 1. BImSchV ☐ Wiederkehrende Messung nach § 15 Absatz 3 1. BImSchV ☐ Wiederholungsmessung nach § 14 Absatz 5 1. BImSchV ☐ Wiederholungsmessung nach § 15 Absatz 5 1. BImSchV
	Ausfertigung für
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung	über das Ergebnis der Überprüfung und Messung an einer Feuerstätte für gasförmige Brennstoffe gemäß der Verordnung über die Kehrung und Überprüfung von Anlagen (Kehr- und Überprüfungsordnung – KÜO) vom 16. Juni 2009 (BGBl. I S. 1292), nach Rechtsverordnungen nach § 1 Absatz 1 Satz 3 SchfHwG oder der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S.38)

Wärmeaustauscher: Hersteller, Typ, Herstell-Nr., Errichtung		Leistungsbereich	Nennleistung
Brenner: Hersteller, Typ, Herstell-Nr., Errichtung	Brennerart	Leistungsbereich	Brennstoff
Feuerstättenart		Art der Anlage	

Überprüfungsergebnis gemäß KÜO (✓ = in Ordnung, X = mangelhaft, – = nicht zutreffend):

Verbrennungsluft/Lüftung		Abgasabzug:		Abgasleitung	
Feuerstätte:		– an der Strömungssicherung		O_2-Gehalt im Abgas	%
– Befestigung/Abstände		– in Brennerhöhe		unverdünnter CO-Gehalt	ppm
– äußerer Zustand		– an anderer Stelle		O_2-Differenz im Ringspalt	%
Brenner/Heizgasweg		Abgasklappe		Lufttemperatur im Ringspalt	℃
Flammenbild		Verbindungsstück		Druckdifferenz im Ringspalt	Pa

☐ Folgende Mängel wurden festgestellt: ☐ Es wurden keine Mängel festgestellt.

☐ Die Mängel stellen zzt. noch keine unmittelbare Gefahr dar, eine Überprüfung durch einen Fachbetrieb wird empfohlen.
☐ Die Mängel sind aus Sicherheitsgründen bis zum ..... zu beseitigen.
☐ Aufgrund der festgestellten Mängel ist eine zusätzliche Überprüfung der Feuerungsanlage erforderlich.

Messergebnis gemäß 1. BImSchV:				Grenzwert für Abgasverlust	%
Wärmeträgertemperatur	℃	Verbrennungslufttemperatur	℃	Abgastemperatur	℃
Sauerstoffgehalt im Abgas	%	Druckdifferenz	Pa	**Abgasverlust**	%
				Messunsicherheit	%

☐ Das Messergebnis entspricht der Verordnung.

☐ Das Messergebnis entspricht **nicht** der Verordnung, weil .....
Der Betreiber ist verpflichtet, die notwendigen Verbesserungsmaßnahmen an der Anlage zu treffen.
Die Messung ist bis zum ..... zu wiederholen.

Bemerkungen:

Datum Unterschrift des Schornsteinfegers	Falls Mängel festgestellt worden sind, die innerhalb einer Frist zu beseitigen sind, oder das Messergebnis nicht der Verordnung entspricht, geben Sie mir bitte Nachricht, sobald die Mängel beseitigt sind bzw. die Wiederholungsmessung erfolgen kann.

Flüssige Brennstoffe

Anschrift des Schornsteinfegerbetriebes	Datum der Arbeitsausführung
	☐ Überprüfung nach § 1 KÜO ☐ Wiederholungsmessung nach § 1 Absatz 2 KÜO ☐ Erstmessung nach § 14 Absatz 2 1. BImSchV ☐ Wiederkehrende Messung nach § 15 Absatz 3 1. BImSchV ☐ Wiederholungsmessung nach § 14 Absatz 5 1. BImSchV ☐ Wiederholungsmessung nach § 15 Absatz 5 1. BImSchV
	Ausfertigung für
Name und Anschrift des Eigentümers/Verwalters	Betreiber/Aufstellungsort der Anlage: Gebäudeteil:

Bescheinigung	über das Ergebnis der Überprüfung und Messung an einer Feuerstätte für flüssige Brennstoffe gemäß der Verordnung über die Kehrung und Überprüfung von Anlagen (Kehr- und Überprüfungsordnung – KÜO) vom 16. Juni 2009 (BGBl. I S. 1292), nach Rechtsverordnungen nach § 1 Absatz 1 Satz 3 SchfHwG oder der Ersten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV vom 26. Januar 2010, BGBl. I S. 38)

Wärmeaustauscher: Hersteller, Typ, Herstell-Nr., Errichtung		Leistungsbereich	Nennleistung
Brenner: Hersteller, Typ, Herstell-Nr., Errichtung	Brennerart	Leistungsbereich	Brennstoff
Feuerstättenart		Art der Anlage	

Überprüfungsergebnis gemäß KÜO (✓ = in Ordnung, X = mangelhaft, – = nicht zutreffend):

Verbrennungsluft/Lüftung		Brenner/Heizgasweg		Verbindungsstück	
Feuerstätte:		Abgasabzug:		Abgasleitung	
– Befestigung/Abstände		– in Brennerhöhe		unverdünnter CO-Gehalt	ppm
– äußerer Zustand		– an anderer Stelle		O_2-Differenz im Ringspalt	%
				Druckdifferenz im Ringspalt	Pa

☐ Folgende Mängel wurden festgestellt:

☐ Es wurden keine Mängel festgestellt.

☐ Die Mängel stellen zzt. noch keine unmittelbare Gefahr dar, eine Überprüfung durch einen Fachbetrieb wird empfohlen.
☐ Die Mängel sind aus Sicherheitsgründen bis zum ..... zu beseitigen.
☐ Aufgrund der festgestellten Mängel ist eine zusätzliche Überprüfung der Feuerungsanlage erforderlich.

Messergebnis gemäß 1. BImSchV:				Grenzwerte:	Rußzahl		CO-Gehalt	1.300 mg/kWh
					Ölderivate	Keine	Abgasverlust	%
Rußzahl-Einzelwerte				**Rußzahl**-Mittelwert	Ölderivate		**CO-Gehalt**	mg/kWh
Wärmeträgertemperatur		°C	Verbrennungslufttemperatur		°C		Abgastemperatur	°C
Sauerstoffgehalt im Abgas		%	Druckdifferenz		Pa		**Abgasverlust**	%
							Messunsicherheit	%

☐ Das Messergebnis entspricht der Verordnung.

☐ Das Messergebnis entspricht **nicht** der Verordnung, weil .....
Der Betreiber ist verpflichtet, die notwendigen Verbesserungsmaßnahmen an der Anlage zu treffen.
Die Messung ist bis zum ..... zu wiederholen.

Bemerkungen:

Datum	Unterschrift des Schornsteinfegers	Falls Mängel festgestellt worden sind, die innerhalb einer Frist zu beseitigen sind, oder das Messergebnis nicht der Verordnung entspricht, geben Sie mir bitte Nachricht, sobald die Mängel beseitigt sind bzw. die Wiederholungsmessung erfolgen kann.

Annex 4 First Order Implementing the Federal Immission Control Act (Order regarding small and medium firing installations – 1st BImSchV)

First Order Implementing the Federal Immission Control Act (Order regarding small and medium firing installations – 1st BImSchV) [1]

Dated 26 January 2010 (BGBl. I. p. 38)

Eingangsformel

Based on Article 23 (1) in connection with Articles 48b and 59 of the Federal Immission Control Act in the version of the Notification of 26 September 2002 (BGBl. I p. 3830), subsequent to having heard the concerned districts and while maintaining the rights of the German Bundestag, the Federal Government orders:

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[1] The obligations from Directive 98/34/EC of the European Parliament and the Council of 22 June 1998 on a procedure for the provision of information in the field of standards and technical regulations and the rules on Information Society services (OJ L 204 of 21 July 1998, p. 37), last changed by Directive 2006/96/EC (OJ L 363 of 20 December 2006, p. 81) have been observed.

Annex 3 (concerning Article 2 (11) and Article 6)

Determination of the degree of efficiency and nitrogen oxide under test conditions

Annex 4 (concerning Article 3 (5) Number 2, Article 4 (3), (5) and (7), Article 26 (1) Phrase 2 Number 2 and 26 (6))

Requirements for the type test

Section 1

General Provisions

Article 1 Scope of Application

(1) This Order applies to the installation, state and operation of firing installations that do not require approval pursuant to Article 4 of the Federal Immission Control Act.

(2) Articles 4 through 20 as well as Articles 25 and 26 do not apply for

1. firing installations which can be operated, in accordance with the state of the art, without any device for the discharge of flue gases, especially infrared radiant heaters,
2. firing installations which are intended:
   a) to dry items by direct contact with hot flue gases,
   b) to bake foods by direct contact with hot flue gases or prepare food in a similar manner,
   c) to produce spirits in small distilleries pursuant to Article 34 of the Federal Law on the Spirits Monopoly, in the corrected version which was published in the Federal Law Gazette Part III, Classification No. 612-7, last changed by Article 7 of the Law of 13 December 2007 (Federal Law Gazette I p. 2897) with an annual operating time of no more than 20 days or
   d) to produce warm water in hot-water heaters,

   unless they are subject to the scope of application of Article 11,
3. firing installations that, according to the circumstances, are not expected to be run for longer than three months following their start-up at the same location.

Article 2 Definitions

In this Order the following definitions apply:

1. Flue gas loss:

   the difference between the heat capacity of the flue gas and the heat capacity of the combustion air related to the heat value of the fuel;
2. Gross calorific-value appliances:

   heat generators which, based on their construction, utilise the evaporation heat of the water vapour contained in flue gases by condensation;
3. Single-room firing installation:

Firing installation that is primarily used to heat the room in which it is located, and cooking ranges with or without indirectly heated baking device;

4. Emissions:

   the air pollutions originating from a firing installation; concentration specifications refer to the flue gas volume in standard state (273 Kelvin, 1,013 hectopascals) after deducting the moisture content of the water vapour;

5. Firing installation:

   an installation which generates heat by firing fuel; firing installations include the fireplace and, if available, devices for the combustion air supply, connecting piece and exhaust air device;

6. Combustion heat performance:

   the heat capacity of the fuel relating to the lower heat value that can be supplied to a firing installation during continuous operation per time unit;

7. Wood preservatives:

   Substances used for the treatment and processing of wood with biocidal effect against wood-destructive insects or fungi and wood-colouring fungi; furthermore, substances to lower the combustibility of wood;

8. Core of the flue gas flow:

   the part of the flue gas flow that reflects the highest temperature in the cross section of the flue gas duct in the area of the measuring hole;

9. Natural wood:

   wood which has only been exposed to mechanical processing and which has only been insignificantly contaminated with harmful substances during its use;

10. Rated thermal output:

    the highest quantity of useful heat provided by the firing installation during continuous operation per time unit; if the firing installation has been set up for a rated thermal output range, the rated thermal output is the highest useful thermal output that has been permanently set within the limits of the rated thermal output range, which is specified on an additional label; without the additional label, the rated output range is the highest value of the rated thermal output range;

11. Degree of efficiency:

    ratio of the useful heat quantity provided by a firing installation to the heat capacity supplied to the firing installation with the fuel, related to a heating period with defined frequency distribution of the heat requirement in accordance with Annex 3, Number 1;

12. Open fireplace:

    Fireplace for solid fuels which can be operated opened in accordance with regulations as far as the fireplace is not solely intended for preparing food;

13. Masonry heaters:

    Single-room firing installations used as heat storage heaters made from mineral storage materials that are installed directly at the site by a craftsman;

14. Oil derivates:

    non-volatile organic substances that are deposited on the filter paper during the determination of the smoke number;

15. Smoke number:

    the key figure for the blackening which is caused by the dust emissions contained in the flue gas during the determination of the smoke number in accordance with DIN 51402 Part 1, version 1986; measuring unit for the blackening is the optical reflectivity; an increase of the smoke number by 1 corresponds with a decrease of the reflectivity by 10 %;

16. Significant change:

    a change to a fireplace which can significantly change the type or quantity of the emissions; a significant change is always

    a) conversion of a firing installation to a different fuel, unless the firing installation has already been set up for variable fuel use,

    b) replacement of a boiler;

17. Existing firing installations:

    firing installations which have been installed prior to 22 March 2010.

Article 3 Fuels

(1) Only the following fuels may be used in firing installation in accordance with Article 1:

1. hard coal, non-pitch bonded hard coal briquettes, coke,

2. lignite coal, lignite coal briquettes, lignite coke,

3. fuel peat, pressed items from fuel peat,

3a. barbeque charcoal, barbeque charcoal briquettes in accordance with DIN EN 1860, version September 2005,

4. natural chunky wood, including attached bark, especially in the form of split logs, chippings and brushwood and cones,

5. natural non-chunky wood, especially in the form of sawdust, shavings, abrasive dust or bark,

5a. pressed items made of natural wood in the form of wood briquettes in accordance with DIN 51731, version October 1996 or in the form of wood pellets in accordance with the fuel requirements of the DINplus Certification Program “Wood pellets for use in small

firing installations in accordance with DIN 51731-HP 5", version August 2007 and other wood pallets made of natural wood with equal quality,

6. painted, varnished or coated wood and any scrap materials from the same, as far as no wood preservatives have been applied or are included due to treatment, and coatings do not contain any halogen-organic compounds or heavy metals,

7. plywood, chipboard, fibreboard or otherwise glued wood and any scrap materials from the same, as far as no wood preservatives have been applied or are included due to treatment, and coatings do not contain any halogen-organic compounds or heavy metals,

8. straw and other plant materials, cereal which is not intended as food, such as rolled grain, cracked grain, whole grain plants, cereal debris, husk and remainders of cornstalk and pellets from the aforementioned fuels,

9. light fuel oil (EL fuel oil) in accordance with DIN 51603-1, version August 2008, and other light fuel oils meeting similar quality as well as methanol, ethanol, natural vegetable oil or vegetable oil methyl ester,

10. gases from the public gas supply, natural gas or petroleum gas with comparable sulphur content and liquid gas or hydrogen,

11. sewage gas with a volume percent of sulphur compound of up to one per mille, specified as sulphur or biogas from farming,

12. coke oven gas, mine gas, steel gas, blast furnace gas, refinery gas or synthesis gas with a volume content of sulphur compound of up to one per mille, specified as sulphur and

13. other renewable resources, as far as they are authorised in accordance with Paragraph 5.

(2) The mass content of sulphur of the fuels mentioned in Paragraph 1 Number 1 and 2 must not exceed 1 % of the raw substance. For hard coal briquettes or lignite coal briquettes, this requirement is considered fulfilled if a similar limitation of emissions of sulphur dioxide in flue gases is ensured through special pre-treatment.

(3) The fuels mentioned in Paragraph 1 Number 4 through 8 and 13 must only be used in firing installations if their moisture content is below 25 %, related to the dry or oven-dry weight of the fuel. Phrase 1 does not apply to automatically fed firing installations which are, in accordance with manufacturer's statements, suitable for fuels with higher moisture contents.

(4) Pressed items from fuels in accordance with Paragraph 1 Number 5a through 8 and 13 must not be produced by using binders. Excluded are binders made of starch, plant stearin, molasses and cellulose fibre.

(5) Prerequisites for an authorisation as a fuel as defined by Paragraph 1 Number 13 are:

1. standardised fuel quality requirements,

2. proof that the requirements of the emission limit values in accordance with Annex 4 Number 2 can be complied with under test conditions,

3. proof of a measuring program over a period of at least one year which proves that no higher emissions of dioxins, furans and polycyclic hydrocarbon occur during the operation when using the fuel than during the combustion of wood and

4. proof of a measuring program over a period of at least one year which proves that the requirements in accordance with Article 5 (1) can be complied with during the operation by using the fuel.

Section 2

Firing Installations for Solid Fuels

Article 4 General Requirements

(1) Firing installations for solid fuels may only be operated if they are in a proper technical condition. They must only be operated with fuels in accordance with Article 3 (1) which are suitable for use in accordance with the manufacturer's specifications. Installation and operation shall be carried out in accordance with the manufacturer's instructions.

(2) Emission limitations refer to a volume content of oxygen in the flue gas of 13 %.

(3) Single-room firing installations for solid fuels, except masonry heaters and open fireplaces which are installed on or after 22 March 2010 must only be operated if it can be proven with a manufacturer type test for the fireplace type of the single-room firing installations that the requirements for the emission limit values and minimum degree of efficiency in accordance with Annex 4 are complied with under test conditions,

(4) Open fireplaces must only be operated occasionally. Only natural chunky wood in accordance with Article 3 (1) Number 4 or pressed items in the form of wood briquettes in accordance with Article 3 (1) Number 5a may be used in fireplaces.

(5) Masonry heaters installed and operated after 31 December 2014 must be equipped with downstream state-of-the-art equipment to reduce dust. Phrase 1 does not apply to installations for which compliance of the requirements in accordance with Annex 4 Number 1 regarding the use of tiled stoves with feeder firing in accordance with DIN EN 13229/A1, version of October 2005, can be proven as follows:

1) with a measurement carried out by a chimney sweep by corresponding applications of the provisions of Annex 4 Number 3 at the start operating the heater or

2) within the scope of a type test of the prefabricated combustion chamber by applying the provisions of Annex 4 Number 3.

(6) The downstream equipment for dust reduction in accordance with Paragraph 5 must only be used if it has been determined to be suitable by the applicable authority or if a type approval is available. The determination of suitability and type approval are not required if the requirements of ambient air quality protection regulations are complied with in addition to the provisions of building regulations regarding the use of building products.

(7) Firing installations for the fuels listed in Article 3 (1) Number 8 and 13 which have been installed on or after 22 March 2010 must only be operated if it can be proven with a

manufacturer fire installation type test that the requirements for the emission limit values in accordance with Annex 4 Number 2 are complied with under test conditions.

(8) Within one year after the installation or after an operator change, the operator of a hand-fed firing installation for solid fuels must consult a chimney sweep in connection with other chimney sweeping work regarding the appropriate operation of the firing installation, proper storage of the fuel and particularities for handling solid fuels.

Article 5 Firing installations with a Rated Thermal Output of 4 Kilowatts or More

(1) Firing installations for solid fuels with a rated thermal output of 4 kilowatts or more, excluding single-room firing installations, must be installed and operated in a manner that the mass concentrations determined in accordance with Annex 2 do not exceed the following emission limit values for dust and carbon monoxide (CO):

	Fuel pursuant to Article 3 (1)	Rated thermal output [kilowatt]	Dust [g/m³]	CO [g/m³]
Level 1: Installations which are installed on or after 22 March 2010	Numbers 1 through 3a	≥ 4 ≤ 500	0,09	1,0
		>500	0,09	0,5
	Numbers 4 through 5	≥4 ≤ 500	0,10	1,0
		> 500	0,10	0,5
	Number 5a	≥ 4 ≤ 500	0,06	0,8
		> 500	0,06	0,5
	Numbers 6 through 7	≥ 30 ≤ 100	0,10	0,8
		> 100 ≤ 500	0,10	0,5
		> 500	0,10	0,3
	Numbers 8 and 13	≥ 4 < 100	0,10	1,0
Level 2: Installations which are installed after 31 December 2014	Numbers 1 through 5a	≥ 4	0,02	0,4
	Numbers 6 through 7	≥ 30 ≤ 500	0,02	0,4
		> 500	0,02	0,3
	Numbers 8 and 13	≥ 4 < 100	0,02	0,4

In deviation of Phrase 1, the limit values of level 2 apply to installations that have been installed after 31 December 2016 if fuels in accordance with Article 3 (1) Number 4 in the form of split logs are used.

(2) The fuels mentioned in Article 3 (1) Number 6 or Number 7 must only be used in firing installations with a rated thermal output of 30 kilowatts or more and only in wood treatment and wood processing undertakings.

(3) The fuels mentioned in Article 3 (1) Number 8 and 13 must only be used in automatically fed firing installations which are, in accordance with the manufacturer's statements, suitable for these fuels and which have been tested within the scope of the type test in accordance with

Article 4 (7) for the respective fuels. The fuels mentioned in Article 3 (1) Number 8 excluding straw, must only be used in undertakings of agriculture, forestry, horticulture and undertakings of the agricultural commercial sector that are handling cereal, especially mills and the agricultural trade.

(4) Firing installations with liquid heat transfer medium, excluding single-room firing installations which are installed for the use of the fuels mentioned in Article 3 (1) Number 4 through 8 and 13 and which are installed on or after 22 March 2010, a water heat accumulator with a volume of twelve litres per litre of fuel filling space shall be made available. A water heat accumulator with a volume of 55 litres per kilowatt rated thermal output must be used. In deviation of Phrase 1, a water accumulator with a volume of at least 20 litres per kilowatt rated thermal output is sufficient for automatically fed systems. In deviation of Phrases 1 and 2, a different heat accumulator with the same capacity can be used. Phrases 1 and 2 do not apply for

1. automatically fed firing installations which comply with the requirements of Paragraph 1 for the lowest output which can be set,
2. firing installations which are used to cover the basic and medium load in a heat supply system if at least half of the total output is provided by an additional boiler and
3. firing installations which are run exclusively at full load due to their intended function.

Section 3

Oil and Gas-Fired Installations

Article 6 General Requirements

(1) Oil and gas-fired installations used to heat buildings or rooms with water as the heat transfer medium and a combustion heat performance below 10 megawatts, which have been installed after 22 March 2010 may only be operated if it can be proven for the used boiler/burner units, boilers and burners by a manufacturer's certificate that the content of nitrogen oxides, specified as nitrogen dioxide, which was determined in the flue gas under test conditions according to the procedure specified in Annex 3 Number 2, depending on the rated thermal output, does not exceed the following values:

1. if EL fuel oil in accordance with Article 3 (1) Number 9 is used:

Rated thermal output [KW]	Emissions in mg/kWh
up to 120	110
> 120 ≤ 400	120
> 400	185

2. if gas from the public gas supply is used:

Rated thermal output [KW]	Emissions in mg/kWh
up to 120	60
> 120 ≤ 400	80
> 400	120

Options to further reduce emissions of nitrogen oxide with measures affecting the fuelling in accordance with state-of-the-art technology shall be utilised.

(2) In oil and gas-fired installations used to heat buildings or rooms with water as the heat transfer medium which have been installed or significantly changed by exchanging the boiler on or after 22 March 2010, central-heating boilers with a rated thermal output of more than 400 kilowatts may only be used if it can be proven by a manufacturer certificate that their degree of efficiency, determined under test conditions according to the procedures specified in Annex 3 Number 1, does not fall below 94 %.

(3) The requirements under Paragraph 2 are also considered fulfilled for central-heating boilers with a rated thermal output of more than 1 megawatt if the boiler efficiency, determined in accordance with the procedures specified in Annex 3 Number 1, does not fall below 94 %.

(4) In deviation of Paragraph 1, for boiler/burner units and boilers and burners which have been produced in a Member State of the European Union or a different Contracting State of the Treaty on the European Economic Area, the content of nitrogen oxide in the flue gas may also be determined in a procedure which is equal to the procedure of Annex 3 Number 2, especially in a procedure which has been defined in accordance with a European standard.

Article 7 Oil-Burning Firing Installations with Vaporising Burners

Oil-burning firing installations with vaporising burners are to be installed and operated in a manner that

1. the blackening, determined in accordance with the procedure of Annex 2, Number 3.2 caused by dust emissions contained in the flue gas does not exceed smoke number 2,
2. the flue gas loss of the test carried out in accordance with the procedure of Annex 2, Number 3.3 are free from oil derivates,
3. the limit values for flue gas loss in accordance with Article 10 (1) are complied with and
4. the carbon monoxide emissions do not exceed a value of 1,300 milligrams per kilowatt hour.

In the case of installations with a rated thermal output of 11 kilowatts or less which have been installed prior to 1 November 1996, in deviation of Phrase 1 Number 1, smoke number 3 must not be exceeded.

Article 8 Oil-Burning Firing Installations with Atomising Burners

Oil-burning firing installations with atomising burners are to be installed and operated in a manner that

1. the blackening, determined in accordance with the procedure of Annex 2, Number 3.2 caused by dust emissions contained in the flue gas does not exceed smoke number 1,
2. the flue gases of the test carried out in accordance with the procedure of Annex 2, Number 3.3 are free from oil derivates,

3. the limit values for flue gas loss in accordance with Article 10 (1) are complied with and

4. the carbon monoxide emissions do not exceed a value of 1,300 milligrams per kilowatt hour.

In the case of installations which have been installed by 1 October 1988, in the territory specified in Article 3 of the Unification Treaty by 3 October 1990, in deviation of Phrase 1, smoke number 2 must not be exceeded unless the installations have been or will be significantly changed after these dates.

Article 9 Gas-Fired Firing Installations

(1) For firing installations which are regularly run with gas from the public gas supply and with EL flue oil for a maximum of 300 hours per year in accordance with Article 3 (1) Number 9 during the operation with EL flue oil for all operating temperatures, an emission limit value for nitrogen oxide of 250 milligrams per kilowatt hour of flue gas applies.

(2) Gas-fired firing installations shall be installed and operated in a manner that the limit values for the flue gas loss in accordance with Article 10 (1) are complied with.

Article 10 Limiting Flue Gas Losses

(1) For oil and gas-fired installations, the flue gas losses determined for the fireplace in accordance with the procedure of Annex 2, Number 3.4 must not exceed the percentages below:

Rated thermal output in kilowatts	Limit values for flue gas losses as percentage
≥ 4 ≤ 25	11
> 25 ≤ 50	10
> 50	9

If the flue gas loss limit value in accordance with Paragraph 1 cannot be complied with due to the construction type of the boiler for an oil and gas-fired installation which is equipped with a central-heating boiler which fulfils the requirements of Directive 92/42/EEC of the Council of 21 May 1992 regarding the efficiency of new hot-water boilers equipped with liquid or gaseous fuels (OJ L 167 of 22 June 1992, p. 17, L 195 of 14 July 1992, p. 32), last amended by Directive 2008/28/EC (OJ L 81 of 20 March 2008 p. 48), a value applies which is one percentage point higher if the central-heating boiler is specified in the declaration of conformity in accordance with Article 7 (2) of the Directive 92/42/EEC as a standard central-heating boiler in accordance with Article 2 and is labelled with a CE label in accordance with Article 7 (1) of the Directive 92/42/EEC.

(2) Oil and gas-fired installations for which the limit values for flue gas loss in accordance with Paragraph 1 cannot be complied with due to their intended functions, must be installed and operated in a manner that they comply with the state of technology of the respective process or construction type.

(3) Paragraph 1 does not apply for

1. single-room firing installations with a rated thermal output of 11 kilowatts or less and

2. firing installations which are exclusively used for hot water generation at a rated thermal output of 28 kilowatts or less.

Article 11 Oil and Gas-Fired Installations with a Thermal Input of 10 Megawatts to 20 Megawatts

(1) In deviation of Articles 6 through 10, single firing installations for liquid fuels in accordance with Article 3 (1) Number 9 with a thermal input from 10 megawatts up to below 20 megawatts may only be installed and operated if

1. the emissions of carbon monoxide do not exceed the emission limit value of 80 milligrams per cubic metre flue gas,
2. the emissions of nitrogen oxides, specified as nitrogen dioxide do not exceed the emission limit value of
    a) 180 milligrams per cubic metre for boilers with an operating temperature of below 110 degrees Celsius,
    b) 200 milligrams per cubic metre for boilers with an operating temperature of 110 to 210 degrees Celsius,
    c) 250 milligrams per cubic metre for boilers with an operating temperature of above 210 degrees Celsius,

    for EL fuel oil, each time calculated for a nitrogen content in the EL fuel oil of 140 milligrams per kilogram and
3. the smoke opacity does not exceed smoke number 1,

for Numbers 1 and 2, referring to an oxygen content of 3 %, as a half-hour average value.

(2) In deviation of Articles 6 through 10, single firing installations for gas from the public gas supply, natural gas or liquid gas with a thermal input from 10 megawatts up to below 20 megawatts may only be installed and operated if emissions from

1. carbon monoxide do not exceed the emission limit value of 80 milligrams per cubic metre flue gas and
2. nitrogen oxides, specified as nitrogen dioxide, do not exceed the emission limit value of
    a) 100 milligrams per cubic metre for boilers with an operating temperature of below 110 degrees Celsius for natural gas,
    b) 110 milligrams per cubic metre for boilers with an operating temperature of 110 to 210 degrees Celsius for natural gas,
    c) 150 milligrams per cubic metre for boilers with an operating temperature of above 210 degrees Celsius for natural gas and
    d) 200 milligrams per cubic metre of flue gas if the other gasses are used,

related to an oxygen content of 3 %, as a half-hour average value.

(3) Single firing installations which are regularly run with fuels in accordance with Paragraph 2 and for a maximum of 300 hours per year with fuels in accordance with Paragraph 1, during

the operation with fuel in accordance with Paragraph 1 for all operating temperatures, an emission limit value for nitrogen oxide of 250 milligrams per cubic metre of flue gas applies.

Section 4

Monitoring

Article 12 Measuring Hole

The operator of a firing installation which is required, in accordance with Articles 14 and 15, to be measured by a chimney sweep, must produce or commission to produce a measuring hole which complies with the requirements of Annex 1. If a firing installation has several connecting pieces, a measuring hole must be produced in each connecting piece. In cases other than those specified in Phrase 1, upon request of the applicable authority, the operator must allow that a measuring hole is produced.

Article 13 Measuring Equipment

(1) Any measuring to determine emissions and flue gas losses must be carried out by using measuring procedures and measuring equipment which comply the state-of-the-art of measuring technology.

(2) Any measurements in accordance with Articles 14 and 15 must be carried out with appropriate measuring equipment. Measuring equipment is considered appropriate if it has passed a performance test.

(3) The utilised measuring equipment must be inspected semi-annually by an organisation which will be announced by the authority that is responsible in accordance with the provincial law.

Article 14 Monitoring of New and Significantly Changed Firing Installations

(1) The operator of a firing installation for solid fuels that has been installed or significantly changed on or after 22 March 2010 must comply with the requirements of Article 19 (1) and (2). Compliance is to be determined by a chimney sweep prior to the start-up of the installation; this determination can also be carried out in connection with other chimney sweeping work.

(2) The operator of a firing installation that has been installed or significantly changed on or after 22 March 2010 for which requirements have been defined in Article 3 (3), Article 4 (1), (3) through (7), Article 5, Article 6 (1) through (3) or Articles 7 through 10, must comply with the respective requirements according to determination by a chimney sweep within four weeks after the start-up of the installation;

(3) Paragraph 2 does not apply for

1. single-room firing installations used with liquid fuels with a rated thermal output of 11 kilowatts or less,
2. firing installations with a rated thermal output of 11 kilowatts or less which are exclusively used for domestic water heating,

3. firing installations using methanol, ethanol, hydrogen, biogas, sewage gas, mine gas, steel gas, blast furnace gas or refinery gas and firing installations using natural gas or petroleum gas, in each case at the extraction site,

4. firing installations which have been set up as gross calorific-value appliances, as far as compliance with the requirements of limiting flue gas loss in accordance with Article 10 shall be determined.

(4) The measurements specified in Paragraph 2 shall be carried out during regular operating times of a firing installation in accordance with Annex 2. The chimney sweep shall issue a certificate in accordance with Annex 2 Number 4 and 5 to the operator regarding the result of the measurements and regarding performed monitoring tasks in accordance with Paragraph 1.

(5) If an inspection in accordance with Paragraph 2 reveals that the requirements have not been fulfilled, the operator must correct the deficiency and commission a chimney sweep to repeat the determination of compliance with the requirements. The regulations of the law on chimney sweeping of 26 November 2008 (BGBl. I p. 2242) remain unchanged.

Article 15 Recurrent Inspections

(1) The operator of a firing installation using fuels which are specified in Article 3 (1) Number 1 through 8 and 13 with a rated thermal output of 4 kilowatts or more, excluding single-room firing installations, must have compliance with the requirements of Articles 5 (1) and 25 (1) Phrase 1 checked once in every other calendar year by a chimney sweep by recurrent measurements, beginning on the dates specified in these provisions. Within the scope of the inspection in accordance with Phrase 1, compliance with the requirements for the fuels in accordance with Article 3 (3), Article 4 (1) and Article 5 (2) and (3) must be checked.

(2) The operator of a single-room firing installation for solid fuels must comply with the requirement in accordance with Article 3 (3) and Article 4 (1) in connection with the regular fireplace inspection by the district master chimney sweep.

(3) The operator of an oil-fired installation with a rated thermal output of 4 kilowatts and more, for which requirements have been defined in Articles 7 through 10, must have compliance with the respective requirements checked

1. once in every third calendar year for installations with a start-up date or date of a significant change in accordance with Article 2 Number 16 (b) which was 12 years or less in the past, and

2. once in every other calendar year for installations with a start-up date or date of a significant change in accordance with Article 2 Number 16 (b) which was more than 12 years ago,

by a chimney sweep who carries out measurements. In deviation of Phrase 1, the operator of an installation with self-calibrating continuous adjustment of the combustion process must have compliance of the requirements determined every fifth calendar year.

(4) Paragraphs 1 through 3 do not apply for

1. firing installations in accordance with Article 14 (3) and

2. gas-fired installations with outside wall connection which have been installed prior to 1 January 1985.

(5) Article 14 (4) and (5) applies accordingly.

Article 16 Compilation of Measurement Results

The district master chimney sweep reports the measurement results in accordance with Articles 14 and 15 every calendar year, based on more specific instructions by the Chimney Sweep Guild, to the appropriate Regional Guild Association. The Regional Guild Associations for Chimney Sweeps creates overviews of the measurement results for each calendar year and presents these overviews, within the scope of the chimney sweeps guilds' legal obligation to disclose, to the highest regional authority responsible for ambient air quality protection, or authority responsible in accordance with regional law by 30 April of the following year. The competent Central Guild Association for Chimney Sweeps prepares for each calendar year a corresponding trans-regional overview and presents it to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety by 30 June of the following year.

Article 17 Self-Monitoring

1) In the case of firing installations of the Federal Armed Forces (Bundeswehr), the tasks of the chimney sweeps and district master chimney sweeps in accordance with Articles 14 through 16 are carried out by authorities of the responsible Administration as far as the execution of the Federal Immission Control Act and the legal regulations which are based on this Act is, in accordance with Article 1 of the Order on Facilities for National Defence of 9 April 1986 (BGBl. I p. 380), the responsibility of Federal Authorities. The Administration informs the respective local regional authority responsible for the execution of this Order and the district master sweep of this exercising of self-monitoring.

(2) The authorities mentioned in Paragraph 1 address the certificates in accordance with Article 14 (4) and information in accordance with Article 16 (1) to the responsible Administration. Instead of the chimney sweep log, it shall keep comparable records.

(3) The responsible Administration prepares country-wide overviews regarding the measurement results in accordance with Articles 14 and 15 and informs the highest regional authorities for ambient air quality protection or authorities responsible in accordance with regional law and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety within the time periods in accordance with Article 16 Phrases 2 and 3.

Article 18 Monitoring of Oil and Gas-Fired Installations with a Thermal Input of 10 Megawatts to 20 Megawatts

(1) In deviation of Articles 12 through 17, the operator of a single firing installation used with liquid fuels in accordance with Article 3 (1) Number 9 with a thermal input of 10 megawatts to less than 20 megawatts which has been installed after 22 March 2010 must equip this installation prior to its start-up with appropriate measuring devices that continuously measure and register the smoke opacity. The measuring device must allow determination that smoke number 1 has been complied with.

(2) The operator of a single firing installation in accordance with Paragraph 1 must have an organisation, which has been named by the highest regional authority responsible for calibrations or authority responsible in accordance with regional law, certify proper installation of the measuring devices in accordance with Paragraph 1 and have the measuring devices calibrated within three months after start-up and each checked for functional capability after no later than one year. The operator must have the calibration repeated no later than three years after the last calibration. The operator must present the certificate regarding the proper installation, reports regarding the calibration result, and test of the functional capability to the responsible authority each within three months after execution.

(3) The operator must prepare or commission preparation of a measurement report regarding the interpretation of the continuous measurements of smoke opacity and present it to the appropriate authority within three months after completion of each calendar year. The operator must keep the records for five years after presenting them to the authority.

(4) In deviation of Articles 12 through 17, the operator of a single firing installation must have compliance with the requirements under Article 11 regarding carbon monoxide and nitrogen oxide checked at the earliest three months and at the latest six months after start-up by an organisation that has been named in accordance with Article 26 of the Federal Immission Control Act. The operator must have the inspection under Phrase 1 repeated after a significant change and otherwise, at an interval of three years.

(5) In accordance with Paragraph 4, three individual measurements are required. Those must, as far as technically feasible, be carried out at different load levels (light, medium and full load). The result of each individual measurement must be specified as a half-hour average value.

(6) In accordance with Paragraph 4, the operator of a firing installation must prepare a measurement report regarding the individual measurements and present it to the responsible authority within three months after execution of the measurement. The measurement report must include information regarding the measurement planning, result, used measurement procedure and operating conditions that were of importance for the evaluation of the measurement results. The operator must keep the reports for five years subsequent presenting them to the authority.

(7) The emission limit values are considered complied with if no result of any individual measurement exceeds the respective emission limit value in accordance with Article 11 (5).

Section 5

Common Provisions

Article 19 Discharge Conditions for Flue gases

(1) The outlets of chimneys for firing installations for solid fuels, which have been installed or significantly changed after 22 March 2010, must

1. in the case of roof slopes
    a) up to and including 20 degrees, tower above the ridge by at least 40 centimetres or be at least 1 metre away from the roof surface,

b) of more than 20 degrees, tower above the ridge by at least 40 centimetres or have a horizontal distance to the roof surface of at least 2 metres and 30 centimetres;

2. in the case of firing installations with a total thermal output of up to 50 kilowatts, tower within a radius of 15 meters above the top edges of the ventilation openings, windows or doors by at least 1 metre; the radius is increased by 2 meters for each additional commenced 50 kilowatts up to a maximum of 40 metres.

(2) In deviation of Paragraph 1, the height of the outlet opening for firing installations with a thermal input of 1 megawatt to 10 megawatts, must

1. tower above the highest edge of the roof ridge by at least 3 metres and

2. be at least 10 metres above floor.

In the case of a roof slope of less than 20 degrees, the height of the outlet opening must be referred to a fictitious roof ridge, the height of which must be calculated based on a roof slope of 20 degrees. Phrase 1 Number 1 does not apply to firing installations at hot working plants if wind baffle ventilation is used.

(3) In deviation of Paragraph 1, the flue gases of firing installations under Article 11 must be discharged via one or several chimneys, the height of which must be calculated based on the provisions of the Technical Instructions on Air Quality of 24 July 2002 (GMBI 2002, p. 511).

Article 20 Notification and Proof

(1) The operator of a firing installation in accordance with Article 11 must notify the responsible authority no later than one month prior to its start-up of this firing installation.

(2) The operator of a firing installation must ensure that the proof regarding any tasks performed by a chimney sweep is sent to the district master chimney sweep. The district master chimney sweep must enter the performed work in the chimney sweep log.

Article 21 Further Requirements

The right of the responsible authority to lay down further instructions based on Articles 24 and 25 of the Federal Immission Control Act remains unchanged.

Article 22 Allowing Exceptions

Upon request, the responsible authority may allow exceptions from the requirements of Articles 3 through 11, 19, 25 and 26 if they result, in individual cases, due to special circumstances from an unreasonable effort or in any other way in undue hardship and if no damaging environmental impacts are to be expected.

Article 23 Accessibility of Standards

DIN, DIN EN standards and the VDI regulations referred to in this Order have been published at Beuth Verlag GmbH Berlin. The certification program for wood pellets, referred to in Article 3 (1) Number 5a can be obtained from DIN CERTCO, Gesellschaft für Konformitätsbewertung mbH, Alboinstrasse 56, 12103 Berlin. The DIN, DIN EN standards, VDI regulations and

certification program for wood pellets are stored in the archives of the German Patent and Trademark Office (Deutsches Patent- und Markenamt) in Munich.

Article 24 Regulatory Offences

Anyone is considered in breach of the regulations as defined by Article 62 (1) Number 7 of the Federal Immission Control Act who intentionally or negligently,

1. contrary to Article 3 (1),uses other fuels than those listed therein,
2. contrary to Article 4 (1) Phrase 2, Paragraphs 3 or 7, runs a firing installation,
3. contrary to Articles 5 (1), 7, 8 or 9 (2), does not properly install or run a firing installation,
4. contrary to Article 5 (2) or (3), uses fuels in firing installations or operations other than those specified therein,
5. contrary to Article 6 (2), uses a central-heating boiler in a firing installation,
6. contrary to Article 11 (1) or (2), installs or runs a single firing installation,
7. contrary to Article 12 Phrase 3, does not allow a measuring hole to be produced,
8. contrary to Article 14 (2), Article 15 (1), (2) or (3) or Article 25 (4) Phrase 1 or Phrase 2, fails to have the requirements specified therein determined or fails to do so in time, or fails to have them monitored or fails to do so in time,
9. contrary to Article 18 (1) Phrase 1, fails to equip a single firing installation, fails to do so properly or fails to do so in time,
10. contrary to Article 18 (2) Phrase 1, fails to have a measuring device calibrated or fails to do so in time, or fails to have it checked or fails to do so in time,
11. contrary to Article 18 (2) Phrase 2, fails to have the calibration repeated or fails to do so in time,
12. contrary to Article 18 (2) Phrase 3, fails to present a certificate or report or fails to do so in time,
13. contrary to Article 18 (3) or (6) Phrase 1 or Phrase 3 fails to present a measurement report or fails to do so in time, or fails to keep it or fails to do so for at least five years,
14. contrary to Article 18 (4), fails to have compliance with the therein mentioned requirements checked or fails to do so in time, or fails to have a check repeated or fails to do so in time,
15. contrary to Article 20 (1) or (2) Phrase 1, fails to submit a notification, or fails to do so properly or fails to do so in time, or fails to ensures that the therein mentioned proof is sent
16. contrary to Article 25 (1) Phrase 1 or Article 26 (1) Phrase 1, continues to run a firing installation or
17. contrary to Article 25 (4) Phrase 1, fails to have compliance with the therein mentioned requirements checked, or fails to do so in time.

Section 6

Transition Rulings

Article 25 Transition Rulings for Firing Installations for Solid Fuels, Single-Room Firing Installations Not Included

(1) Existing firing installations for solid fuels may only continue to be run if the limit values of level 1 of Article 5 (1), depending on the date of installation, starting from the following dates, are complied with:

Date of installation	Effective date to comply with the limit values of level 1 of Article 5 (1)
Until including 31 December 1994	01 January 2015
1 January 1995 through 31 December 2004	01 January 2019
1 January 2005 through 21 March 2010	01 January 2025

The determination of the date as of when the installations must comply with the limit values in accordance with Phrase 1 is carried out no later than 31 December 2012 by the district master chimney sweep within the scope of the fireplace inspection. If no fireplace inspection has been carried out by 31 December 2012, the date of installation can also be determined in connection with other chimney sweep work.

(2) From 22 March 2010 until the dates specified in Paragraph 1 Phrase 1, the following limit values, which are to be determined in accordance with Annex 2, apply for existing firing installations for solid fuels with a rated thermal output of more than 15 kilowatts, not including single-room firing installations, depending on the utilised fuels:

Fuel pursuantto Article 3 (1) / Rated thermal output in kW	Numbers 1 to 3a	Numbers 4 to 5a	
	Dust [g/m³]	Dust [g/m³]	Dust [g/m³]
> 15 ≤ 50	0,15	0,15	4
> 50 ≤ 150	0,15	0,15	2
> 150 ≤ 500	0,15	0,15	1
> 500	0,15	0,15	0,5

Fuel pursuant to Article 3 (1) / Rated thermal output in kW	Numbers 6 and 7	
	Dust [g/m³]	Dust [g/m³]
> 50 ≤ 100	0,15	0,8
> 100 ≤ 500	0,15	0,5
> 500	0,15	0,3

Fuel pursuant to Article 3 (1) / Rated thermal output in kW	Number 8	
	Dust [g/m³]	Dust [g/m³]
> 15 ≤ 100	0,15	4

In deviation of Article 4 (2), until the dates specified in Paragraph 1, the emission limitations for the fuels in accordance with Article 3 (1) Number 1 through 3a refer to a volume content of oxygen in the flue gas of 8 percent. In the case of hand-fed firing installations without buffer storage, when the fuels specified in Article 3 (1) Number 4 through 8 are utilised, the requirements of the table are to be complied with while the combustion air supply is throttled.

(3) For firing installations for solid fuels with a rated thermal output of 4 kilowatts and more, not including single-room firing installations, installed after 22 March 2010 and prior to 1 January 2015, the limit values of level 1 of Article 5 (1) continue to apply after 1 January 2015.

(4) The operator of an existing firing installation for solid fuels for which the requirements of Paragraph 2 have been specified must have compliance of the requirements monitored by 31 December 2011 and subsequently, every two years, by a chimney sweep. Within the scope of the inspection in accordance with Phrase 1, compliance with the requirements in accordance with Article 3 (3), Article 4 (1) and Article 5 (2) and (3) Phrase 1 must be checked. Article 14 (3) and (5) applies accordingly.

(5) The operator of an existing hand-fed firing installation for solid fuels must consult a chimney sweep in accordance with Article 4 (8) by 31 December 2014.

(6) The operator of a firing installation for solid fuels installed or significantly changed after 22 March 2010 must only have the monitoring in accordance with Article 14 (2) for compliance with the requirements mentioned in Article 5 (1) for installations with a rated thermal output up to 15 kilowatts which are run with fuels mentioned in Article 3 (1) Number 1 through 8 and 13 checked six months after notification of an appropriate measuring device as defined by Article 13 (2). Further requirements of Article 14 (2) remain unchanged.

(7) In deviation of Paragraph 4 and Article 15 (1), firing installations for solid fuels must only be checked for compliance of the requirements in accordance with Paragraphs 1 and 2 and Article 5 (1) six months after notification of an appropriate measuring device as defined by Article 13 (2), not including

1. mechanically-fed firing installations using the fuels specified in Article 3 (1) Number 1 through 5a, 8 or 13 with a rated thermal output of more than 15 kilowatts and
2. firing installations using the solid fuels specified in Article 3 (1) Number 6 or 7 with a rated thermal output of more than 50 kilowatts.

The requirements of Article 15 (1) Phrase 2 remain unchanged.

Article 26 Transition Rulings for Single-Room Firing Installations for Solid Fuels

(1) Single-room firing installations for solid fuels which have been installed and started up prior to 22 March 2010 may only continue to be run if the following limit values are not exceeded:

1. Dust: 0.15 grams per cubic metre
2. Carbon monoxide: 4 grams per cubic metre.

Proof of compliance with the limit values can be provided

1. by presenting the testing facility measuring certificate from the manufacturer or
2. by a measurement applying the provisions of Annex 4 (3) carried out by a chimney sweep.

(2) If proof regarding compliance with the limit values cannot be provided by 31 December 2013, existing single-room firing installations must be retrofit with a state-of-the-art device that reduces dust emissions or shut down, at the following dates, depending on the date on the type plate:

Date on the type plate	Date for retrofit or shutdown
Up to and including 31 December 1974 or date no longer ascertainable from the type plate	31 December 2014
1 January 1975 up to and including 31 December 1984	31 December 2017
1 January 1985 up to and including 31 December 1994	31 December 2020
1 January 1995 up to and including 21 March 2010	31 December 2024

Article 4 (6) applies accordingly.

(3) Paragraphs 1 and 2 do not apply for

1. non-commercially used cooking ranges and ovens with a rated thermal output below 15 kilowatts,
2. open fireplaces in accordance with Article 2 Number 12,
3. masonry heaters in accordance with Article 2 Number 13,
4. single-room heating installations in residential units, heat supply of which is exclusively provided by these installations and
5. single-room firing installations for which the operator can show credibly to the district master chimney sweep that they have been manufactured or installed prior to 1 January 1950.

(4) Paragraph 2 does not apply to fireplace inserts, tiled stove inserts or comparable oven inserts which are bricked in. Those must be equipped with state-of-the-art downstream devices for dust reduction by the dates specified in Paragraph 2 Phrase 1. Article 4 (6) applies accordingly.

(5) The operator of an existing single-room firing installation must have the date of the type approval determined by the district master chimney sweep within the scope of the fireplace inspection by 31 December 2012. If no fireplace inspection has been carried out by 31 December 2012, the determination of the type approval date can also be carried out in connection with other chimney sweep work. Proof in accordance with Paragraph 1 Phrase 2 must be presented to the district master chimney sweep by no later than 31 December 2012. The master district chimney sweep must inform the operator of the installation within the scope of a fireplace inspection or in connection with other chimney sweep work, no later than 2 years prior to the date of retrofit or shutdown.

(6) For single firing installations for solid fuels installed after 22 March 2010 and prior to 31 December 2014, the limit values of Annex 4 (1), level 1 continue to apply after 1 January 2015.

(7) The operator of an existing firing installation for solid fuels must consult a chimney sweep in connection with other chimney sweep work by 31 December 2014 in accordance with Article 4 (8).

Article 27 Transition Rulings for Chimney Sweep Work after 01 January 2013

The authorised district chimney sweeps in accordance with Article 48 Phrase 1 of the law on chimney sweeping replace the district master chimney sweep as of 1 January 2013.

Section 7

Final Provision

Article 28 Entry into Force, Expiry

This Order becomes effective on 22 March 2010. At the same time, the Order regarding small and medium firing installations of 14 March 1997 (BGBl. I p. 490), last changed by Article 4 of the Order of 14 August 2003 (BGBl. I p. 1614), expires.

The Federal Council has accreed.

Annex 1 (concerning Article 12)

(References (in German): (BGBl. I 2010, p. 50)

Measuring hole

1. The measuring hole must always be installed in the connecting piece between the heat generator and the chimney behind the last heat exchanger. If the firing installation is operated in connection with an flue gas purification device, the measuring hole must be installed behind the flue gas purification device. The measuring hole shall be installed at a distance that equals approximately double of the diameter of the connecting piece, behind the flue outlet of the heat exchanger or the flue gas purification device.
2. A measuring hole is allowed at a different location to the locations specified in (1) above if repeatable flow conditions exist and no higher heat losses occur in the inlet path than what is specified under (1) above.
3. The measuring hole must not show any dust or soot deposits that could significantly affect the measurements.

Annex 2 (concerning Articles 5 (1), 7, 8, 10, 14 (4), 15 (5), 25 (2))

Requirements for carrying out measurements during operation

1. General requirements

Measurement of the moisture content

The determination of the moisture content shall be carried out with measuring devices intended for measuring the electric conductivity. Other equal measuring methods for determining the moisture content may be used.

Measuring flue gas parameters

1.1 The measurements are to be carried out at the measuring hole in the core of the flue gas flow. If a firing installation has several measuring holes, the measurements shall be carried out at each measuring hole.

1.2 The functional capacity of the measuring devices must be checked prior to the measurements. Manufacturers' instructions included in the operating instructions must be complied with.

1.3 The measurements must be carried out in uninterrupted continuous operation state of the firing installation with thermal heat output, alternatively with the highest thermal output which can be set, in a manner that the results are representative and can be compared with each other in the case of comparable firing installations and operating conditions.

1.4 For the evaluation of the operating state, the pressure difference between the flue gas and the ambient air, as well as the temperature of the flue gas must be measured. The result of the temperature measurement in accordance with 3.4.1 can be used. The temperature of the heat transfer medium displayed by the operating measurement devices must be measured in or behind the heat generator. In the case of firing installations with multistage or modulating burners, the output that has been set for the measurement must be recorded.

1.5 The measuring program must always be carried out completely. It should not be cancelled if one individual measurement is negative.

2. Measurements on firing installations for solid fuels

2.1 To fulfil the requirements of 1.3, measurements must be carried out at a boiler temperature of at least 60 °C. An additional requirement for hand-fed firing installations is that measurements must start within five minutes after the largest fuel quantity specified by the manufacturer in the operating instructions has been applied to embers that are sufficient for the ignition.

2.2 In each case, the emissions must be determined simultaneously with the oxygen content in the flue gas as a quarter-hour average value. The emissions must be determined with a measurement device, the suitability of which has been tested. Based on the relationship

$$E_B = \frac{21 - O_{2\,B}}{21 - O_2} \times E_M$$

the measured emissions are to be converted to the reference oxygen content. The meaning of the abbreviations:

E_B = emissions relating to the reference oxygen content

E_M = measured emissions

O_{2B} = reference oxygen content in % by volume

O_2 = volume content of oxygen in dry flue gas

2.3 The result of the measurements is to be determined subsequent to the conversion to the standard state and reference oxygen content of the flue gas with one decimal place more than the numerical value of the defined emission limit value. Rounding should be carried out in accordance with 4.5.1 of DIN 1333, version of February 1992. The emission limit value has been complied with if it is not exceeded by the measured value minus the measurement uncertainty.

2.4 For measurements in the partial load range in accordance with Article 25 (2), proceed as follows:

2.4.1 In the case of firing installations without combustion air blower, measuring must be carried out for the first five minutes with an open combustion air throttle valve and for the remaining ten minutes with a closed combustion air throttle valve.

2.4.2 In the case of firing installations with an unregulated combustion air blower (on-off control), measuring must be carried out for five minutes with a running blower and for ten minutes with a switched-off blower.

2.4.3 Firing installations with a controlled combustion air blower (speed controller, level control, air quantity control via baffle, orifice plate or throttle valve and similar) must be measured for fifteen minutes with reduced combustion air supply.

3. Measurements for oil and gas-fired Installations

3.1 To fulfil the requirements of 1.3, in the case of oil-burning firing installations with atomising burners and gas-fired installations, measurements should be commenced at the earliest two minutes after the burner has been switched on, and in the case of oil-burning firing installations with vaporising burner at the earliest two minutes after the rated thermal output has been set. For hot-water heating systems, the boiler water temperature should be at least 60° C at the start of the measurements. This does not apply to hot-water heating systems, the boiler of which is run at temperatures below 60 °C due to their intended function (gross calorific-value appliances, low temperature boilers with variable control).

3.2 The smoke number must be determined visually in accordance with the procedure of DIN 51402, Part 1, version of October 1986. Three individual measurements must be carried out. An additional individual measurement is to be performed each time when the applied filter paper becomes noticeably moist or reflects an uneven degree of blackening. From the individual measurements the means must be formed. The result that has been rounded to the next whole number complies with the Order if the defined smoke number is not exceeded.

3.3 Checking of the flue gas for the presence of oil derivates shall be carried out by means of the filter papers which have been used for the determination of the smoke number. The applied filter papers shall initially be inspected with the naked eye for oil derivates. If any discolouration is ascertained during this check, the filter is to be rejected for the smoke number determination. If a definite decision is not possible, subsequent to the smoke number determination, a flux material test in accordance with DIN 51402, Part 2, version of March 1979, shall be carried out. The requirements of this Order are fulfilled if no oil derivates are determined on any of the three filter samples.

3.4 Determination of the flue gas loss

3.4.1 The oxygen content of the flue gas and the flue gas temperature shall be determined quasi-continuously as an average value of a time period of 30 seconds each simultaneously at the same point. The temperature of the combustion air is measured near the suction hole of the heat generator and for firing installations independent of room air, at an appropriate location in the supply pipe.

The flue gas loss is calculated from the average values of the quasi-continuous measurement of the flue gas temperature and the oxygen content, and the measured values for the oxygen content and temperature of the combustion air according to the following formula:

$$q_A = (t_A - t_L) \cdot \left(\frac{A}{21 - O_{2,A}} + B \right)$$

The meaning of the abbreviations:

q_A = flue gas loss in %

t_A = exhaust gas temperature in °C

t_L = combustion air temperature in °C

$O_{2,A}$ = volume content of oxygen in dry flue gas in %

	EL heating oil, natural vegetable oils, vegetable oil methyl ester	Gasses from the public gas supply	Coke oven gas	Liquid gas and liquid gas/air mixtures
A =	0,68	0,66	0,60	0,63
B =	0,007	0,009	0,011	0,008

3.4.2 Number 2.3 applies accordingly.

4 Content of certificate regarding monitoring measurements of firing installations for liquid and gaseous fuels

The certificates in accordance with Articles 14 (5) or 15 (5) must at least include the following information:

General information

Name and address of the chimney sweep or district master chimney sweep

Name and address of the owner

Installation location of the firing installation

Legal basis for the inspection

Heat exchanger: Manufacturer, type, year of installation, capacity range and nominal capacity

Burner: Manufacturer, type, year of installation, output range and output during measurement

Type of burner (with blower, without blower, vaporising burner)

Fuel (name and number pursuant to Article 3 (1))

Type of firing installation, e.g. central heating, single-room firing installation, heating with hot-water generation, hot water generation

Measuring result

Temperature of heat transfer medium

Combustion air temperature

Flue gas temperature

Oxygen content in the flue gas

Pressure difference

Determined flue gas loss by specifying the measurement uncertainty

For installations with liquid fuels: smoke number from all individual measurements and average value of smoke number

For installations with liquid fuels: result of the check for oil derivates

Limit values from this Order relevant for the installation.

Other monitoring tasks

Information regarding the inspection of the requirements in accordance with Article 6 (2) and (3) (manufacturer certificate)

5. Content of certificate regarding monitoring measurements of firing installations for solid fuels

The certificates in accordance with Articles 14 (5) or 15 (5) must at least include the following information:

General information

Name and address of the chimney sweep or district master chimney sweep

Name and address of the owner

Installation location of the firing installation

Legal basis for the inspection and measurement

Fireplace: manufacturer, type, year of installation, capacity range and nominal capacity, fireplace model, feeding method

Fuel (name and number pursuant to Article 3 (1))

Type of firing installation (central heating, single-room firing installation, heating with hot-water generation, hot-water generation)

Measuring result

Temperature of heat transfer medium

Flue gas temperature

Oxygen content in the flue gas

Pressure difference

Determined dust content in the flue gas by specifying the measurement uncertainty

Determined carbon monoxide in the flue gas by specifying the measurement uncertainty

Limit values from this Order relevant for the installation.

Other monitoring tasks

Determined moisture content in the fuels specified in Article 3 (1) Number 4, 5 and 6 through 8

Information regarding the inspection of the requirements in accordance with Article 4(1)

Only during start-up

Information regarding a consultation in accordance with Article 4 (8)

Information regarding the inspection of the requirements in accordance with Article 4 (3) and (6) and Article 6 (1) (manufacturer certificates)

Annex 3 (concerning Article 2 (11) and Article 6)

(References (in German): BGBl. I 2010, p. 54)

Determination of the degree of efficiency and nitrogen oxide under test conditions

1. Determination of the degree of efficiency

   1.1 The degree of efficiency shall be determined in accordance with DIN EN 303-5, version of June 1999.

   1.2 The degree of efficiency can be determined for the heating boiler type on a testing facility or for individual heating boilers at an already installed firing installation. If the determination is carried out at an already installed firing installation, the provisions that apply for testing on a testing facility shall be applied correspondingly.

   1.3. The uncertainty of the determination method must not exceed 3 % of the determined degree of efficiency value. The requirements for the degree of efficiency are considered complied with if the determined values plus the uncertainty in accordance with Phrase 1 do not fall below the defined limit values.

2. Determination of the nitrogen oxide content

   2.1 The emission check shall be carried out for the burner type in accordance with DIN EN 267, version of November 1999, or on the test flame tube by applying this DIN standard correspondingly. The boiler type with an inspected burner that is to be selected by the manufacturer and the boiler/burner units shall be checked on the test facility by applying this DIN standard correspondingly.

   2.2 For individual burners or burner/boiler combinations, the checks in accordance with 2.1 can also be carried out on already installed firing installations by correspondingly basing the checks on DIN EN 267, version of November 1999.

   2.3 Certified calibration gases shall be used for the calibration of the measurement devices. For gas burners and gas-burner/boiler combinations, G20 (methane) shall be used as test gas.

   2.4 The requirements for the nitrogen oxide content of the waste gas are considered complied with if by considering the measurement tolerances of DIN EN 267, version of November 1999,

      a) for single-stage burners, the values which have been determined in the test points of the work field do not exceed the defined limit values,

      b) for boilers and boiler/burner units, the standard emission factor EN determined in accordance with DIN EN 303-5, version 1999, and for multi-stage or modulated burners the standard emission factor EN determined based on this standard, does not exceed the defined limit values.

Annex 4 (concerning Article 3 (5) Number 2, Article 4 (3), (5) and (7), Article 26 (1) Phrase 2 Number 2 and Article 26 (6)

(References (in German): BGBl. I 2010, p. 55 - 56)

Requirements for the type test

1. Emission limit values and minimum degrees of efficiency for single-room firing installations for solid fuels (requirements for the type test)

		Level 1: Installation on or after 22 March 2010		Level 2: Installation after 31 December 2014		Installation on or after 22 March 2010
Type of fireplace	Technical rules	CO [g/m3]	Dust [g/m^3]	CO [g/m^3]	Dust [g/m^3]	Minimum degree of efficiency [%]
Room heater with flat-layer firing	DIN EN 13240 (version of October 2005) short heating period	2,0	0,075	1,25	0,04	73
Room heater with feeder firing	DIN EN 13240 (version of October 2005) long-term heating	2,5	0,075	1,25	0,04	70
Heat storage stoves	DIN EN 15250/A1 (version of June 2007)	2,0	0,075	1,25	0,04	75
Fireplace inserts (closed operation)	DIN EN 13229 (version of October 2005)	2,0	0,075	1,25	0,04	75
Tiled stove inserts with flat-layer firing	DIN EN 13229/A1 (version of October 2005)	2,0	0,075	1,25	0,04	80
Tiled stove inserts with feeder firing	DIN EN 13229/A1 (version of October 2005)	2,5	0,075	1,25	0,04	80
Cooking ranges	DIN EN 12815 (version of September 2005)	3,0	0,075	1,50	0,04	70
Heating stoves	DIN EN 12815 (version of September 2005)	3,5	0,075	1,50	0,04	75
Pellet stoves without hot water heat exchanger	DIN EN 14785 (version of September 2006)	0,40	0,05	0,25	0,03	85
Pellet stoves with hot water heat exchanger	DIN EN 14785 (version of September 2006)	0,40	0,03	0,25	0,02	90

Other single-room firing installations for heating which cannot be assigned to any of the fireplace types or technical rules in the table must comply with the requirements for room heaters with flat-layer firing (DIN EN 13240, version of October 2005).

Other single-room firing installations for cooking and baking or for cooking, baking and heating which cannot be categorised by any of the fireplace types or technical rules in the table must comply with the requirements for cooking ranges (DIN EN 12815, version of September 2005).

Type tests can only be carried out by appointed authorities which are authorised to carry out tests in accordance with the harmonised standards of Directive 89/106/EWG of the Council of 21 December 1988 to adjust the laws and administrative provisions of the Member States regarding building products (OJ L40 of 11 February 1989, p. 12), last amended by Directive (EC) 1882/2003 (OJ L284 of 31 October 2003, p.1).

2. Limit values for installations with the fuels specified in Article 3(1) Number 8 and 13 (requirements for the type test)

Dioxins and furans:	0.1 ng/m³
Nitrogen oxides:	
Installations which are installed after 22 March 2010:	0.6 g/m³
Installations that are installed after 31 December 2014:	0.5 g/m³
Carbon monoxide:	0.25 g/m³.

3. Carrying out measurements and determination of the degree of efficiency:

3.1 Carbon monoxide

The carbon monoxide emissions shall be determined at rated thermal output as an standards. In the case of installations for fuels in accordance with Article 3(1)(8), measuring of the carbon monoxide emissions is carried out in parallel with the measurement of nitrogen oxide emissions. average value regarding the combustion period in accordance with the corresponding

3.2 Dust

The determination of the dust emissions is carried out at rated thermal output as a half-hour average value (measuring starts three minutes after fuel input) in accordance with VDI 2066, sheet 1, version 11/2006 or in accordance with the certification program DINplus on the basis of VDI 2066, sheet 1, version 11/2006. Other procedures may also be applied if equal.

3.3 Degree of efficiency

The degree of efficiency shall be determined at rated thermal output via flue gas loss and fuel throughput in accordance with the corresponding standards.

3.4 Nitrogen oxides

The determination is carried out in accordance with DIN EN 14792, version of April 2006. The duration of sample taking is half an hour at rated thermal output; at least three determinations must be carried out for each fuel type.

3.5 Dioxins and furans:

The determination is carried out in accordance with DIN EN 1948, version of June 2006. The duration of sample taking is six hours at rated thermal output; at least three determinations must be carried out for each fuel type.