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ANNEXES 1 to 5

ANNEXES

Annex I to V

to the

COMMISSION REGULATION (EU) No .../..

**implementing Directive 2009/125/EC of the European Parliament and of the Council
with regard to ecodesign requirements for solid fuel boilers**

ANNEX I
Definitions applicable to Annexes II to V

For the purposes of Annexes II to V the following definitions shall apply:

- (1) 'seasonal space heating emissions' means:
 - (a) for automatically stoked solid fuel boilers, a weighted average of the emissions at rated heat output and the emissions at 30% of the rated heat output, expressed in mg/m^3 ;
 - (b) for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, a weighted average of the emissions at rated heat output and the emissions at 50% of the rated heat output, expressed in mg/m^3 ;
 - (c) for manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, the emissions at rated heat output, expressed in mg/m^3 ;
 - (d) for solid fuel cogeneration boilers, the emissions at rated heat output, expressed in mg/m^3 .
- (2) 'fossil fuel boiler' means a solid fuel boiler that has fossil fuel or a blend of biomass and fossil fuel as preferred fuel;
- (3) 'solid fuel boiler housing' means the part of a solid fuel boiler designed for fitting a solid fuel heat generator;
- (4) 'model identifier' means the code, usually alphanumeric, which distinguishes a specific solid fuel boiler model from other models with the same trade mark or manufacturer's name;
- (5) 'condensing boiler' means a solid fuel boiler in which, under normal operating conditions and at given operating water temperatures, the water vapour in the combustion products is partially condensed, in order to make use of the latent heat of this water vapour for heating purposes;
- (6) 'combination boiler' means a solid fuel boiler that is designed to also provide heat to deliver hot drinking or sanitary water at given temperature levels, quantities and flow rates during given intervals, and is connected to an external supply of drinking or sanitary water;
- (7) 'other woody biomass' means woody biomass other than: log wood with a moisture content of 25% or less, chipped wood with a moisture content of 15% or higher, compressed wood in the form of pellets or briquettes, or sawdust with a moisture content equal to or less than 50%;
- (8) 'moisture content' means the mass of water in the fuel in relation to the total mass of the fuel as used in solid fuel boilers;
- (9) 'other fossil fuel' means fossil fuel other than bituminous coal, brown coal (including briquettes), coke, anthracite or blended fossil fuel briquettes;
- (10) 'electrical efficiency' or ' η_{el} ' means the ratio of the electricity output and the total energy input of a solid fuel cogeneration boiler, expressed in %, whereby the total energy input is expressed in terms of *GCV* or in terms of final energy multiplied by *CC*;

- (11) ‘gross calorific value’ or ‘*GCV*’ means the total amount of heat released by a unit quantity of fuel containing the appropriate moisture content, when it is burned completely with oxygen, and when the products of combustion are returned to ambient temperature; this quantity includes the condensation heat of the water vapour formed by the combustion of any hydrogen contained in the fuel;
- (12) ‘conversion coefficient’ or ‘*CC*’ means a coefficient reflecting the estimated 40% average EU generation efficiency referred to in Directive 2012/27/EU of the European Parliament and of the Council¹; the value of the conversion coefficient is $CC = 2.5$;
- (13) ‘electric power requirement at maximum heat output’ or ‘ el_{max} ’ means the electric power consumption of the solid fuel boiler at rated heat output, expressed in kW, excluding electricity consumption from a back-up heater and from incorporated secondary emission abatement equipment;
- (14) ‘electric power requirement at minimum heat output’ or ‘ el_{min} ’ means the electric power consumption of the solid fuel boiler at applicable part load, expressed in kW, excluding electricity consumption from a back-up heater and from incorporated secondary emission abatement equipment;
- (15) ‘back-up heater’ means a Joule-effect electric resistance element that generates heat only to prevent the solid fuel boiler or the water-based central heating system from freezing or when the external heat source supply is disrupted (including during maintenance periods) or out of order;
- (16) ‘applicable part load’ means for automatically stoked solid fuel boilers, operation at 30% of rated heat output, and for manually stoked solid fuel boilers that can be operated at 50% of rated heat output, operation at 50% of rated heat output;
- (17) ‘standby mode power consumption’ or ‘ P_{SB} ’ means the power consumption of a solid fuel boiler in standby mode, excluding from incorporated secondary emission abatement equipment, expressed in kW;
- (18) ‘standby mode’ means a condition where the solid fuel boiler is connected to the mains power source, depends on energy input from the mains power source to work as intended and provides only the following functions, which may persist for an indefinite time: reactivation function, or reactivation function display and only an indication of enabled reactivation function, or information or status display;
- (19) ‘seasonal space heating energy efficiency in active mode’ or ‘ η_{son} ’ means:
- for automatically stoked solid fuel boilers, a weighted average of the useful efficiency at rated heat output and the useful efficiency at 30% of the rated heat output, expressed in %;
 - for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, a weighted average of the useful efficiency at rated heat output and the useful efficiency at 50% of the rated heat output, expressed in %;
 - for manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, the useful efficiency at rated heat output, expressed in %;

¹ OJ L 315, 14.11.2012, p. 1.

- (d) for solid fuel cogeneration boilers, the useful efficiency at rated heat output, expressed in %;
- (20) ‘useful efficiency’ or ‘ η ’ means the ratio of the useful heat output and the total energy input of a solid fuel boiler, expressed in %, whereby the total energy input is expressed in terms of GCV or in terms of final energy multiplied by CC ;
- (21) ‘useful heat output’ or ‘ P ’ means the heat output of a solid fuel boiler transmitted to the heat carrier, expressed in kW;
- (22) ‘temperature control’ means the equipment that interfaces with the end-user regarding the values and timing of the desired indoor temperature, and communicates relevant data to an interface of the solid fuel boiler such as a central processing unit, thus helping to regulate the indoor temperature(s);
- (23) ‘gross calorific value moisture free’ or ‘ GCV_{mf} ’ means the total amount of heat released by a unit quantity of fuel dried of inherent moisture, when it is burned completely with oxygen, and when the products of combustion are returned to ambient temperature; this quantity includes the condensation heat of the water vapour formed by the combustion of any hydrogen contained in the fuel;
- (24) ‘equivalent model’ means a model placed on the market with the same technical parameters set out in Table 1 of point 2 of Annex II as another model placed on the market by the same manufacturer.

ANNEX II

Ecodesign requirements

1. Specific ecodesign requirements

From 1 January 2020 solid fuel boilers shall comply with the following requirements:

- (a) seasonal space heating energy efficiency for boilers with a rated heat output of 20 kW or less shall not be less than 75 %;
- (b) seasonal space heating energy efficiency for boilers with a rated heat output of more than 20 kW shall not be less than 77 %;
- (c) seasonal space heating emissions of particulate matter shall not be higher than 40 mg/m³ for automatically stoked boilers and not be higher than 60 mg/m³ for manually stoked boilers;
- (d) seasonal space heating emissions of organic gaseous compounds shall not be higher than 20 mg/m³ for automatically stoked boilers and not be higher than 30 mg/m³ for manually stoked boilers;
- (e) seasonal space heating emissions of carbon monoxide shall not be higher than 500 mg/m³ for automatically stoked boilers and not be higher than 700 mg/m³ for manually stoked boilers;
- (f) seasonal space heating emissions of nitrogen oxides, expressed in nitrogen dioxide, shall not be higher than 200 mg/m³ for biomass boilers and not be higher than 350 mg/m³ for fossil fuel boilers;

These requirements shall be met for the preferred fuel and for any other suitable fuel for the solid fuel boiler.

2. Requirements for product information

From 1 January 2020 the following product information on solid fuel boilers shall be provided:

- (a) in the instruction manuals for installers and end-users, and on the free-access websites of manufacturers, their authorised representatives and importers:
 - (1) the information included in Table 1, with its technical parameters measured and calculated in accordance with Annex III and showing the number of significant figures indicated in the table;
 - (2) any specific precautions to be taken when the solid fuel boiler is assembled, installed or maintained;
 - (3) instruction on the proper way to operate the solid fuel boiler and on the quality requirements for the preferred fuel and any other suitable fuels;
 - (4) for solid fuel heat generators designed for solid fuel boilers, and solid fuel boiler housings to be equipped with such heat generators, their characteristics, the requirements for assembly (to ensure compliance with the ecodesign requirements for solid fuel boilers) and, where appropriate, the list of combinations recommended by the manufacturer.

- (b) on a part for professionals of the free-access websites of manufacturers, their authorised representatives and importers: information relevant to disassembly, recycling and disposal at end-of-life.
- (c) in the technical documentation for the purposes of conformity assessment pursuant to Article 4:
 - (1) the information listed in points (a) and (b);
 - (2) a list of all equivalent models, if applicable;
 - (3) where the preferred fuel or any other suitable fuel is other woody biomass, non-woody biomass, other fossil fuel or other blend of biomass and fossil fuel as referred to in Table 1, a description of the fuel sufficient for its unambiguous identification and the technical standard or specification of the fuel, including the measured moisture content, and the measured ash content, and for other fossil fuel also the measured volatile content of the fuel.
- (d) the electrical capacity, marked in a permanent manner on the solid fuel cogeneration boiler.

The information referred to in point (c) may be merged with the technical documentation provided in accordance with measures under Directive 2010/30/EU.

Table 1: Information requirements for solid fuel boilers

Model identifier(s)							
Stoking mode: [Manual: the boiler should be operated with a hot water storage tank of a volume of at least x* litre / Automatic: it is recommended that the boiler be operated with a hot water storage tank of a volume of at least x** litre]							
Condensing boiler: [yes/no]							
Solid fuel cogeneration boiler: [yes/no]				Combination boiler: [yes/no]			
Fuel	Preferred fuel (only one):	Other suitable fuel(s):	η_s [x%]:	Seasonal space heating emissions****			
				PM	OGC	CO	NO _x
				[x] mg/m ³			
Log wood, moisture content ≤ 25 %	[yes/no]	[yes/no]					
Chipped wood, moisture content 15-35 %	[yes/no]	[yes/no]					
Chipped wood, moisture content > 35 %	[yes/no]	[yes/no]					
Compressed wood in the form of pellets or briquettes	[yes/no]	[yes/no]					
Sawdust, moisture content ≤ 50 %	[yes/no]	[yes/no]					
Other woody biomass	[yes/no]	[yes/no]					
Non-woody biomass	[yes/no]	[yes/no]					
Bituminous coal	[yes/no]	[yes/no]					
Brown coal (including briquettes)	[yes/no]	[yes/no]					
Coke	[yes/no]	[yes/no]					
Anthracite	[yes/no]	[yes/no]					
Blended fossil fuel briquettes	[yes/no]	[yes/no]					
Other fossil fuel	[yes/no]	[yes/no]					
Blended biomass (30-70%)/fossil fuel briquettes	[yes/no]	[yes/no]					
Other blend of biomass and fossil fuel	[yes/no]	[yes/no]					
Characteristics when operating with the preferred fuel only:							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Useful heat output				Useful efficiency			
At rated heat output	P_n ****	x,x	kW	At rated heat output	η_n	x,x	%
At [30%/50 %] of rated heat output, if applicable	P_p	[x,x/ N.A.]	kW	At [30%/50 %] of rated heat output, if applicable	η_p	[x,x/ N.A.]	%
For solid fuel cogeneration boilers: Electrical efficiency				Auxiliary electricity consumption			
At rated heat output	$\eta_{el,n}$	x,x	%	At rated heat output	el_{max}	x,xxx	kW
				At [30%/50 %] of rated heat output, if applicable	el_{min}	[x,xxx/ N.A.]	kW
				Of incorporated secondary emission abatement equipment, if applicable		[x,xxx/ N.A.]	kW
				In standby mode	P_{SB}	x,xxx	kW
Contact details	Name and address of the manufacturer or its authorised representative.						
* Tank volume = $45 * P_r * (1 - 2.7 / P_r)$ or 300 litres, whichever is higher, with P_r indicated in kW							
** Tank volume = $20 * P_r$ with P_r indicated in kW							
*** For the preferred fuel P_n equals P_r							
**** PM= particulate matter, OGC= organic gaseous compounds, CO= carbon monoxide, NO _x = nitrogen oxides							

ANNEX III

Measurements and calculations

1. For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published for this purpose in the *Official Journal of the European Union*, or using other reliable, accurate and reproducible methods that take into account the generally recognised state-of-the-art methods. They shall meet the conditions and technical parameters set out in points 2 to 6.
2. General conditions for measurements and calculations
 - (a) Solid fuel boilers shall be tested for the preferred fuel and any other suitable fuels indicated in table 1 of Annex II, with the exception that boilers tested for chipped wood with a moisture content of more than 35% meeting the applicable requirements are considered to also meet such requirements for chipped wood with a moisture content of 15-35% and are not required to be tested for chipped wood with a moisture content of 15-35%.
 - (b) Declared values for seasonal space heating energy efficiency and seasonal space heating emissions shall be rounded to the nearest integer.
 - (c) Any solid fuel heat generator designed for a solid fuel boiler, and any solid fuel boiler housing to be equipped with such a heat generator, shall be tested with an appropriate solid fuel boiler housing and heat generator.
3. General conditions for seasonal space heating energy efficiency
 - (a) The useful efficiency values η_n, η_p and the useful heat output values P_n, P_p shall be measured, as appropriate. For solid fuel cogeneration boilers the electrical efficiency value $\eta_{el,n}$ is also measured.
 - (b) The seasonal space heating energy efficiency η_s shall be calculated as the seasonal space heating energy efficiency in active mode η_{son} , corrected by contributions accounting for temperature controls, auxiliary electricity consumption, and, for solid fuel cogeneration boilers, by adding the electrical efficiency multiplied by a conversion coefficient CC of 2.5.
 - (c) The consumption of electricity shall be multiplied by a conversion coefficient CC of 2.5.
4. Specific conditions for seasonal space heating energy efficiency
 - (a) The seasonal space heating energy efficiency η_s is defined as:
$$\eta_s = \eta_{son} - F(1) - F(2) + F(3)$$
where:
 - (1) η_{son} is the seasonal space heating energy efficiency in active mode expressed as a percentage, calculated as set out in point 4(b);
 - (2) $F(1)$ accounts for a loss of seasonal space heating energy efficiency due to adjusted contributions of temperature controls; $F(1) = 3\%$;
 - (3) $F(2)$ accounts for a negative contribution to the seasonal space heating energy efficiency by auxiliary electricity consumption, expressed as a percentage, and is calculated as set out in point 4(c);

- (4) $F(3)$ accounts for a positive contribution to the seasonal space heating energy efficiency by the electrical efficiency of solid fuel cogeneration boilers, expressed as a percentage, and is calculated as follows:

$$F(3) = 2.5 \cdot \eta_{el,n}$$

- (b) the seasonal space heating energy efficiency in active mode, η_{son} , is calculated as follows:

- (1) for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, and for automatically stoked solid fuel boilers:

$$\eta_{son} = 0.85 \cdot \eta_p + 0.15 \cdot \eta_n$$

- (2) for manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, and for solid fuel cogeneration boilers:

$$\eta_{son} = \eta_n$$

- (c) $F(2)$ is calculated as follows:

- (1) for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, and for automatically stoked solid fuel boilers:

$$F(2) = 2.5 \cdot (0.15 \cdot el_{max} + 0.85 \cdot el_{min} + 1.3 \cdot P_{SB}) / (0.15 \cdot P_n + 0.85 \cdot P_p)$$

- (2) for manually stoked solid fuel boilers that cannot be operated at 50% or less of the rated heat output in continuous mode, and for solid fuel cogeneration boilers:

$$F(2) = 2.5 \cdot (el_{max} + 1.3 \cdot P_{SB}) / P_n$$

5. Calculation of gross calorific value

The gross calorific value (GCV) shall be obtained from the gross calorific value moisture free (GCV_{mf}) by applying the following conversion:

$$GCV = GCV_{mf} \times (1 - M)$$

where:

- (a) GCV and GCV_{mf} are expressed in megajoules per kilogram;
 (b) M is the moisture content of the fuel, expressed as a proportion.

6. Seasonal space heating emissions

- (a) Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10% oxygen and standard conditions at 0 °C and 1013 millibar.

- (b) The seasonal space heating emissions E_s of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides are calculated as follows:

- (1) for manually stoked solid fuel boilers that can be operated at 50% of the rated heat output in continuous mode, and for automatically stoked solid fuel boilers:

$$E_s = 0.85 \cdot E_{s,p} + 0.15 \cdot E_{s,n}$$

- (2) for manually stoked solid fuel boilers that cannot be operated at 50 % or less of the rated heat output in continuous mode, and for solid fuel cogeneration boilers:

$$E_s = E_{s,n}$$

where:

- (a) $E_{s,p}$ are the emissions of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides measured at 30 % or 50 % of rated heat output, as applicable;
 - (b) $E_{s,n}$ are the emissions of respectively particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides measured at rated heat output.
- (c) Emissions of particulate matter shall be measured by a gravimetric method excluding any particulate matter formed by organic gaseous compounds when flue gas is mixed with ambient air.
- (d) Emissions of nitrogen oxides shall be calculated as the sum of nitrogen monoxide and nitrogen dioxide, and expressed in nitrogen dioxide.

ANNEX IV

Verification procedure for market surveillance purposes

When performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC, the authorities of the Member States shall apply the following verification procedure for the requirements set out in Annex II:

1. The Member State authorities shall test one single unit per model. The unit shall be tested with one or more fuels with characteristics in the same range as the fuel(s) that were used by the manufacturer to perform measurements according to Annex III.
2. The model shall be considered to comply with the applicable requirements set out in Annex II to this Regulation if:
 - (a) the values in the technical documentation comply with the requirements set out in Annex II; and
 - (b) testing of the model parameters listed in Table 2 shows compliance for all of those parameters;
3. If the result referred to in point 2(a) is not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation. If the result referred to in point 2(b) is not achieved, the Member State authorities shall randomly select three additional units of the same model for testing. As alternative, the three additional units selected may be of one or more equivalent models which have been listed as equivalent product in the manufacturer's technical documentation.
4. The model shall be considered to comply with the applicable requirements set out in Annex II to this Regulation if testing of the model parameters listed in Table 2 for the three additional units shows compliance for all of those parameters.
5. If the results referred to in point 4 are not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation. The Member State authorities shall provide the test results and other relevant information to the authorities of the other Member States and to the Commission within one month of taking the decision on non-compliance of the model.

Member State authorities shall use the measurement and calculation methods set out in Annex III.

The verification tolerances set out in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation.

Table 2

Parameter	Verification tolerances
Seasonal space heating energy efficiency η_s	The determined value ⁽¹⁾ is not more than 4% lower than the declared value of the unit.
Emissions of particulate matter	The determined value ⁽¹⁾ is not more than 9 mg/m ³ higher than the declared value of the unit.
Emissions of organic gaseous compounds	The determined value ⁽¹⁾ is not more than 7 mg/m ³ higher than the declared value of the unit.
Emissions of carbon monoxide	The determined value ⁽¹⁾ is not more than 30 mg/m ³ higher than the declared value of the unit.
Emissions of nitrogen oxides	The determined value ⁽¹⁾ is not more than 30 mg/m ³ higher than the declared value of the unit.

⁽¹⁾ the arithmetic average of the values determined in the case of three additional units tested as prescribed in point 3.

ANNEX V

Indicative benchmarks referred to in Article 6

The indicative benchmarks for the best available technology on the market for solid fuel boilers at the time of entry into force of this Regulation are as follows. At the time of entry into force of this Regulation, no single solid fuel boiler was identified meeting all the values specified in points 1 and 2. Several solid fuel boilers met one or more of these values:

1. For seasonal space heating energy efficiency: 96 % for solid fuel cogeneration boilers, 90% for condensing boilers and 84% for other solid fuel boilers.
2. For seasonal space heating emissions:
 - (a) 2 mg/m³ for particulate matter for biomass boilers; 10 mg/m³ for fossil fuel boilers;
 - (b) 1 mg/m³ for organic gaseous compounds;
 - (c) 6 mg/m³ for carbon monoxide;
 - (d) 97 mg/m³ for nitrogen oxides for biomass boilers; 170 mg/m³ for fossil fuel boilers.

The benchmarks specified in points 1 and 2(a) to (d) do not necessarily imply that a combination of those values is achievable for a single solid fuel boiler. An example of a good combination is an existing model with a seasonal space heating energy efficiency of 81 % and seasonal space heating emissions of particulate matter of 7 mg/m³, of organic gaseous compounds of 2 mg/m³, of carbon monoxide of 6 mg/m³ and of nitrogen oxides of 120 mg/m³.