

New Regulation sets demanding Ecodesign requirements for boilers

Ecodesign of Energy Using Products Directive (ED) and Energy Labelling Directive (ELD) are recent legal instruments in European Union aiming to improve the energy efficiency of appliances. While energy labels assist consumers in choosing products which save energy, and thus money, ecodesign is aimed to eliminate the least efficient appliances from the market by establishing specific minimum requirements for specific product groups. The aim is that the ecodesign and the energy labelling requirements be introduced at the same time to facilitate implementation of the two measures and to guarantee the longest possible validity for the energy label. Energy labelling was addressed in REHVA Journal – March 2013 issue. In this article the new Regulation on ecodesign of heaters is presented.



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Background

The Ecodesign Framework Directive (ED) 2009/125/EC establishes a framework for setting *ecodesign requirements* for energy-related products [2]. It is a key instrument of EU policy for improving the energy efficiency and other aspects of the environmental performance of products in the internal market. The Directive addresses products identified by the

Council and the European Parliament as priorities for the Commission for implementation, including heating equipment. Heaters are therefore priority product groups considered for implementing measures under the Ecodesign Directive. Energy Labeling Directive (ELD) establishes a framework for the Commission to develop Delegated Regulations for the *labelling* of energy-related products. [1].

The ED is an important instrument for achieving the objective of 20% energy savings compared with baseline projections for 2020, and its implementation is one of the priorities in the Commission's Communication on Energy 2020 and Energy Efficiency Plan 2011. [3, 4]

Directives are brought into practice by Commission issuing implementing measures in the form of Regulations, Delegated Regulations, Communications, etc.

Contents of the regulation

The Commission Regulation [5] implementing Ecodesign Directive [2] was adopted by voting in the meeting of the Regulatory Committee on Heaters on 13th March 2013. In this regulation energy efficiency requirements for space heaters and for the space heating function of combination heaters are set on the basis of **seasonal space heating efficiency**, which considers the energy inputs to satisfy the space heating demand for a designated heating season under defined conditions.

Energy efficiency requirements for the domestic hot water heating function of combination heaters are set on the basis of load profiles, namely a certain sequence of water draw-offs representing the function of water heating, in accordance with the separate proposed regulation introducing ecodesign requirements for water heaters.

Apart from energy efficiency, the sound power levels and nitrogen oxides emissions are identified as significant environmental aspects for certain heaters. Accordingly, maximum sound power level requirements are proposed for heat pumps. For heaters using fuels, the Regulation sets maximum nitrogen oxides emission levels.

Requirements on minimum seasonal space heating energy efficiency, minimum water heating energy efficiency, maximum sound power level, maximum nitrogen oxides emissions and information to be provided by manufacturers are scheduled as follows:

After 2 years since this Regulation has entered into force:

- minimum seasonal space heating energy efficiency
- minimum useful efficiency at full load and part load of heaters and of combination heaters
- minimum water heating energy efficiency of combination heaters
- maximum sound power level for heat pumps
- new technical information on the product to be provided by manufacturers

After 4 years:

- tougher minimum water heating energy efficiency of combination heaters
- tougher minimum seasonal space heating energy efficiency requirements for heat pumps and electric boilers

After 5 years:

- maximum nitrogen oxides emissions for heaters and combination heaters
- maximum emission values for CHP-units and heat pumps

Measurements and calculations of the relevant product parameters should be performed using generally recognised state-of-the-art calculation and measurement methods. In this context, manufacturers may apply reliable, accurate and reproducible measurement and calculation methods and harmonised standards.

As required in Article 8(2) of Directive [2], the new Regulation [5] specifies the applicable **conformity assessment** procedures, which should be either internal design control as set out in Annex IV to that Directive or the management system set out in Annex V to the Directive, without prejudice to Articles 7(2) and 8 of and Annexes III to V to Council Directive 92/42/EEC [6]. Commission means here that the old boiler efficiency Directive [6] should be repealed, **except for** articles and Annexes mentioned in the previous sentence, and new provisions are laid down in this Regulation to ensure that the scope is extended to heaters other than boilers.

In order to facilitate compliance checks, manufacturers are required to provide **information in the technical documentation** referred to in the conformity assessment procedures. Further standard product information to the end-user is set out in the separate Delegated Regulation on energy labelling. [7, 8]

Technical requirements for boilers

The following definitions are introduced in the Regulation.

'Space heater' means a device that a) provides heat to a water-based central heating system in order to reach and maintain at a desired level the indoor temperature of an enclosed space such as a building, a dwelling or a room; and b) is equipped with one or more heat generators.

‘Combination heater’ means a space heater that is designed to also provide heat to deliver hot drinking or sanitary water at a given temperature levels, quantities and flow rates during given intervals, and is connected to an external supply of drinking sanitary water.

The technical requirements for space heaters and combination heaters are described in the following.

Requirements for seasonal space heating energy efficiency

Two years after this Regulation has entered into force the seasonal space heating energy efficiency and useful efficiencies of heaters shall not fall below the following values:

Fuel boiler space heaters with rated heat output ≤ 70 kW and fuel boiler combination heaters with rated heat output ≤ 70 kW, with the exception of type B11 boilers with rated heat output ≤ 10 kW and type B11*) combination boilers with rated heat output ≤ 30 kW:
The seasonal space heating energy efficiency**) shall not fall below 86%.
Type B11 boilers with rated heat output ≤ 10 kW and type B11 combination boilers with rated heat output ≤ 30 kW:
The seasonal space heating energy efficiency shall not fall below 75%.
Fuel boiler space heaters with rated heat output > 70 kW and ≤ 400 kW and fuel boiler combination heaters with rated heat output > 70 kW and ≤ 400 kW:
The useful efficiency at 100% of the rated heat output shall not fall below 86%, and the useful efficiency at 30% of the rated heat output shall not fall below 94%.

*) type B11 combination boiler means a natural draught fuel boiler combination heater incorporating a draught diverter, intended to be connected to a flue that evacuates the residues of combustion to the outside of the room containing the fuel boiler combination heater, and drawing the combustion air directly from the room; a type B11 combination boiler is marketed as type B11 combination boiler only.

**) See the separate box for calculation of the seasonal space heating energy efficiency.

Requirements for water heating energy efficiency

Two years after this Regulation has entered into force the water heating energy efficiency of combination heaters shall not fall below the following values:

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Water heating energy efficiency	22%	23%	26%	30%	30%	30%	30%	32%	32%	32%

Four years after this Regulation has entered into force the water heating energy efficiency of combination heaters shall not fall below the following values:

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
Water heating energy efficiency	32%	32%	32%	32%	36%	37%	38%	60%	64%	64%

Declared load profile means the load profile applied for conformity assessment. The load profiles are defined in the Annex III of the Regulation.

Requirements for emissions of nitrogen oxides

Five years after this Regulation has entered into force emissions of nitrogen oxides, expressed in nitrogen dioxide, of boiler space heaters and boiler combination heaters shall not exceed the following values:

- fuel boiler space heaters and fuel boiler combination heaters using gaseous fuels: 56 mg/kWh fuel input in terms of GCV;
- fuel boiler space heaters and fuel boiler combination heaters using liquid fuels: 120 mg/kWh fuel input in terms of GCV;

Requirements on technical information

In addition to basic product information presented so far, the new technical information requirements for boiler space heaters and boiler combination heaters now include:

- at 30% part load: useful heat output and the corresponding efficiency
- auxiliary electricity consumption at full load, at part load and in standby mode
- standby heat loss
- ignition burner power consumption
- NO_x emissions
- daily electricity consumption at the declared load profile
- energy efficiency and daily fuel consumption for domestic hot water.

These require background documentation, which is available only through testing. ■

References

See the complete list of references of the article in the html-version at www.rehva.eu -> REHVA Journal

“Seasonal space heating energy efficiency” – a base for setting ecodesign requirements under ED and for energy labelling classification under ELD

All efficiencies are related to gross calorific value (GCV) of the fuel.

The key role in the Regulation plays the *seasonal space heating energy efficiency* η_s , defined as the ratio between the space heating demand for a designated heating season, supplied by a heater and the annual energy consumption required to meet this demand, expressed in %. The computer calculation spreadsheet first introduced in the preparation phase [9] to calculate this figure, and subsequently modified, has finally been replaced by a single formula applicable for all kinds of heaters covered by ED. The formula is not provided in the Regulation itself but in an accompanying draft document [10]. The formula is:

$$\eta_s = 0.85\eta_1 + 0.15\eta_4 - \sum F(i)$$

where for fuel boiler space heaters and fuel boiler combination heaters:

- η_1 is useful efficiency at 30% of the rated heat output, expressed in %;
- η_4 is useful efficiency at rated heat output, expressed in %.

The corrections $F(i)$ for fuel boiler space heaters and fuel boiler combination heaters are:

- $F(1)$ accounts for a negative contribution to the seasonal space heating energy efficiency of heaters due to adjusted contributions of temperature controls. The correction is $F(1) = 3\%$.
- $F(2)$ accounts for a negative contribution to the seasonal space heating energy efficiency by auxiliary electricity consumption, expressed in %, and is given as follows:
 $F(2) = 2.5 \cdot (0.15 \cdot el_{max} + 0.85 \cdot el_{min} + 1.3 \cdot P_{SB}) / (0.15 \cdot P_4 + 0.85 \cdot P_1)$
OR a default value as set out in EN 15316-4-1 may be applied.
- $F(3)$ accounts for a negative contribution to the seasonal space heating energy efficiency by standby heat loss and is given as follows:
 $F(3) = 0.5 \cdot P_{stby} / P_4$
OR a default value as set out in EN 15316-4-1 may be applied.
- $F(4)$ accounts for a negative contribution to the seasonal space heating energy efficiency by ignition burner power consumption and is given as follows:
 $F(4) = 0.5 \cdot P_{ign} / P_4$

Where the notations are:

- P_1 is useful heat output at 30% of rated heat output, expressed in kW
- P_4 is useful heat output at rated heat output, expressed in kW
- P_{stby} is the heat loss of a boiler in operating modes without heat demand, expressed in kW
- P_{ign} is the power consumption of a burner intended to ignite the main burner, expressed in W in terms of GCV
- el_{max} is electric power consumption of a boiler operating at full load, expressed in kW
- el_{min} is electric power consumption of a boiler operating at part load, expressed in kW
- P_{SB} is electric power consumption of a boiler in operating modes without heat demand, expressed in kW

“Useful efficiency” means the ratio of the useful heat output and the total energy input of a boiler space heater, or boiler combination heater, expressed in %, whereby the total energy input is expressed in terms of gross calorific value (GCV) of the fuel.