

**Working document on possible
Ecodesign
Energy labelling
and
Installation requirements
for
Dedicated Water Heaters**

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Working Document – Water Heaters

1. Ecodesign requirements

1. The Water Heaters *regardless of the application for which they are intended*, shall meet the Ecodesign requirements set out in **Annex I**.

These requirements shall apply to the 'CE marked package' as supplied (placed on the market). If any item is not supplied, the default values defined in the 'Annex IV' shall be used.

2. Information and Energy Labelling requirements

Ecodesign information (for all size classes), and Energy Labelling requirements for size class up to and including XXL are set out in **Annex II**.

These information and labelling requirements are optional as from the entry in to force of the implementing measures. They will be compulsory as from 1.01.2010.

3. Installation Requirements

Annex III contains illustrative installation requirements intended to complement the Ecodesign and Labelling requirements. They would require to be introduced in the planned revision of the Energy Performance of Buildings Directive 2002/91/EC¹ (EPBD).

¹ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings OJ L 1, 4.1.2003, p. 65–71

4. Harmonized Rating of Water Heaters

Annex IV gives details of the calculation of 'specific efficiency' of Water Heaters. The basis is a calculation of the energy (primary) consumption of the water heater in question when providing hot water in line with the relevant tapping cycle.

As soon as EN standards have been adopted and 'harmonized', they shall be used instead of the measurement methods described in the **Annex IV**.

However, as manufacturers will have invested substantial sums in developing products based on these calculations, care should be taken that any changes do not have substantial negative effects for these stakeholders.

4.1 Dealing with Climatic differences

The calculations in Annex IV assume that the water heater is installed in a building with an average EU climate. Sensitivity analysis suggests that in general, the climate

zone where a water heater is installed makes little difference to its ranking as against other water heaters. To gain 'single market' advantages, and to avoid the need for manufacturers to attempt to optimize their models in respect of numerous National (or regional) requirements, it is desirable to limit as far as possible any exceptions or variations to energy labelling or minimum requirements. If the variation in performance caused by climate is less than the energy labelling bandwidth, there appears to us to be little reason to adjust this rating for climatic zones.

The only possible products for which this variation may be greater appear to be:

- *Products using outside air based heat pumps, which may perform significantly worse 'Arctic' areas with a high the proportion of the heating season when temperatures are below 0-5°C, and*
- *Some (in particular simple) Solar systems, which will work better in 'Tropical' areas where solar flux is significantly higher (5kW/m² rather than 3KW/m²). High quality solar systems (e.g. with vacuum insulated collectors) will already work well in areas with the lower level of solar flux.*

A possible adaptation would be to define a specific labeling, including not 1 but 3 energy efficiency ratings, the first one for north Europe, the second one for central Europe, and the third one for south Europe, in order to illustrate clearly to the customer the real efficiency in his own geographical area, but maintaining for manufacturers uniformity of the single European market.

5. Significant environmental parameters for water heaters

5.1. The following environmental aspects are identified as significant:

- (a) Energy in the use phase (see annex I.1.1-4)
- (b) Emissions in use phase of
 - i) NO_x (see annex I.1.5)
 - ii) CO
 - iii) Hydrocarbons
 - iv) Particulates
- (c) GWP (Global Warming Potential) of refrigerant fluid used (in heat pumps)

5.2. Ecodesign parameters referred to in Annex I, Part 1 of Directive 2005/32/EC which are not considered as significant: All Ecodesign parameters not addressed by the requirements in the measure.

5.3. For emissions of CO, hydrocarbons and particulates current harmonized measurement standards should be improved as they currently only address steady state.

5.4 For GWP (Global Warming Potential) of the refrigerant –if applicable—If the limit value for GWP-100 is over 2000 then the declared primary energy efficiency value of the Product shall be restricted to a maximum of 104%, independent of the actual established efficiency value. (see Annex I .3.1)

6. Definitions

- A *Water Heater* is a product that is connected to a given external supply of drinking water and is equipped to generate heat and transfer this drinking water to desired temperature levels and at desired quantities, flow rates and intervals.
- The *primary function* of a *Water Heater* is the capability to reach and maintain the desired temperature levels at desired quantities, flow rates and intervals as mentioned in the product definition.
- The *efficiency* of a Water Heater shall be the ratio of the actual primary energy consumption required to fulfill the primary function to the theoretical minimum energy required to fulfill that primary function
- The '*specific efficiency*' of a Water Heater shall be the efficiency as calculated by the Annex IV for a specific load profile.
- The definitions in Annex IV .A shall apply.

Other expressions used in the implementing measure shall have the same meaning as in Directive 2005/32/EC.

7. Scope

All Water Heaters which use one of the heat generation processes:

- combustion of gaseous and/or liquid fossil fuels
- use of the Joule effect in electric resistance heating elements
- capturing solar thermal energy
- capturing ambient heat (air or water or ground source), including but not limited to transformation processes to bring the heat to a higher exergy level (e.g. heat pumps).

Specific measurement methods and calculations are missing from Annex IV for some products (e.g. CHP devices). The present measures (Ecodesign, Energy Labelling, Installation requirements), shall not apply to these products until a method for rating them has been developed and agreed. This may be done by either:

- A harmonized EN standard covering their rating, or
- An amendment to the implementing measures (Annex IV) to include them.

In this case, there will need to be a transitional period (of say 12 months) after the 'harmonization' of the EN standard, or amendment of the implementing measures, during which the measures will be optional.

A similar principle will be applied to any other new technologies that are not covered in annex IV.

Apart from this the scope remains unchanged from WD 1.

The following *Products* are explicitly not included in the scope:

- Water heating devices that are within the scope of Directive 2001/80/EC on Large Combustion Plants (LCPD).
- Water heating devices using solid fuels, including biomass, as an energy source.
- Water heating devices driven by District Heating (“DH”).
- Product components, i.e. devices that are not capable of performing the *primary function*. This includes but is not limited to burners, heat exchangers, storage tanks as well as controls or other provisions for heat generation technologies that are not part of the product offered for CE-marking.
- Water Heaters that are incapable of fulfilling the demands of the smallest tapping cycle are excluded.

8. Benchmarks for best environmental performance

The Benchmarks for the best environmental performance are:

- Energy efficiency – best ratings as in annex II.1
- NOx Emissions – less than 20ppm (see annex I.3)

For other significant environmental parameters the lack of adequate test methods currently rules out the setting of benchmarks.

9. Location of the energy efficiency rating of Water Heaters

The energy efficiency rating of Water heaters shall be placed on a clearly visible and accessible part of the product.

10. Review

A review of the IM shall be presented to the Consultation Forum depending on technological progress and not later than 5 years after its entry into force

Annex I

Ecodesign requirements for Water heaters

I.1 Efficiency Requirements

Minimum Requirements for the 'specific efficiency' % of water heaters as follows

Size		XXS	XS	S	M	L	XL	XXL	3XL	4XL
From 1 Jan										
2009		22	26	26	30	30	30	32	32	32
2011		32	32	32	36	37	40	40	40	40
2013								60	64	64
2015										

I.2 Size limits

Manufacturers shall be free to declare the size category of a 'Water Heater' provided:

- They can fulfill the requirements of the relevant tapping cycle, and
- For categories XXS and XS, they have a storage volume of less than 15L and for S less than 36L.

From 2013 the minimum size category for a water heater capable of providing water in a larger size class shall be as follows:

Capable of fulfilling tapping cycle in respect of size class	Minimum size classification
XL	M
XXL	L
3XL	XL
4XL	XXL

I.3 Emissions in use phase

From 01/01/2013

Emissions of NO_x from CH Boilers, Water heaters and CH Combis shall be subject to the following limit (where applicable):

NO_x; 20 ppm, except 40ppm for products with at least 30% renewable input. This limit shall be after allowing for nitrogen already in the fuel (or when tested with nitrogen free fuel). These limits are equivalent to:

- 35 mg/kW 'smaller' gas boilers without renewable input
- 70 mg/kW gas boilers with renewable input (includes all 'larger' boilers)
- 70 mg/kW 'smaller' oil boilers without renewable input
- 105 mg/kW oil boilers with renewable input (includes all 'larger' boilers)

I.3.1 Possible Variants

The above remains the preferred option. The IA study will look at the effect of imposing less stringent limits. In particular of

- *Raising the non renewables limit by around 25% to 25 ppm.*
- *A limit of 70 mg/kW gas, 105mg/kW oil proposed by EHI*
- *A delay of implementation limited to small (wall hung) oil boilers*

I.4 Conformity assessment

Given the large quantity of energy involved, relatively small variations in results are unusually important. This implies the need for strict quality assurance. The existing draft suggests the use of modules B and C (as currently applies to gas appliances). Other possible variants could be module A2.

As part of the revision of the new approach, the quality assurance modules are being revised²,

and a number of new possibilities should be introduced. While the timing cannot be certain, it is expected that the Decision will have been adopted in time for it to be used in the relevant Ecodesign implementing measures.

The Impact assessment study will investigate the costs and benefits of using different modules.

I.5 Verification procedure

The verification procedure for Ecodesign and energy Labelling will broadly follow the model discussed in the forum on 28 May. However, there are 2 types of data to be checked,

- *The maximum limits under Ecodesign requirements or Energy Labelling thresholds. These shall be considered to be maximum values.*
- *Other information required to be provided (for example the data input defined in Annex IV). These values will be subject to a margin for production variation of \pm [10%].*

The verification procedure will then be as follows:

"The verification procedure for performing the market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), shall be carried out as set out in harmonized standards, which shall be drawn up under mandate from the Commission in accordance with Directive 98/34/EC.

Until the reference numbers of harmonized standards have been published in the Official Journal of the European Union, when performing the market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), Member State authorities shall apply the following verification procedures.

I.5.1 For Ecodesign requirements and Energy Labelling Thresholds

Member State authorities shall test one single unit, applying the procedures referred to or set out in the provisions of this Regulation. If the results exceeds a limit or threshold value, then At least three more units shall be tested. If on average the results for the units tested exceed the limit or threshold, then the model will be considered to have been proved to exceed the relevant value and to have failed to comply if

- Test values for the first unit, and average test values for the second set of tests, exceeding the limit or threshold value by more than
 - Specific efficiency of Water Heater 4%
 - NOx emissions 4%

OR

- An analysis based on the test error of the relevant test house for the test(s) in question that shows that the probability a correctly declared model, could have had the test results, or worse, is very low.

There shall be no need to re-test the value of all parameters in the second set of tests, only those that failed for the first unit.

I.5.2 For Declared values

Member State authorities shall test one single unit, applying the procedures referred to or set out in the provisions of this Regulation. If for a particular parameter the test result differs from the declared value by more than 7%, then at least three more units shall be tested. If the average of the results for the units tested differs from the declared value by more than 7%, then the model will be considered to have been proved to exceed the relevant declared value and to have failed to comply.

Annex II

Energy Labelling

(And Ecodesign information requirements)

II.1 Rating Scale

The labelling/rating thresholds for water heaters shall be as follows. Energy Labelling shall apply to sizes XXS to XXL. For classes 3XL and 4XL the rating scale will be defined as Ecodesign information requirements.

From 1 Jan 2009	XXS	XS	S	M	L	XL	XXL	3XL	4XL
A+++	53	61	72	80	98	112	124	140	150
A++	44	53	55	66	82	92	104	110	120
A+	35	38	38	54	68	76	84	96	96
A	32	35	35	45	56	62	72	80	86
B	29	32	32	39	46	50	60	64	64
C	26	29	29	36	37	40	40	40	40
D	23	26	26	33	34	34	36	36	36
E	20	23	23	30	30	30	32	32	32
F	17	20	20	27	27	27	28	28	28
G	<17	<20	<20	<27	<27	<27	<28	<28	<28

Considerations:

- Tolerances should not allow a jump of more than one classwidth, e.g. at an efficiency of 40% and a tolerance of $\pm 7\%$ the minimum classwidth should be 3% ($7\% \times 40\%$)
- Minimum efficiency levels (Annex I.1) should be used as class-limits to facilitate market surveillance
- The top range (first 3 rows) should provide challenging levels for products using renewable and/or experimental technologies, e.g. solar, heat pumps, vacuum-insulation)
- The mid range (next 5 rows) should provide new products with maximum opportunity for product differentiation, driving the market towards the best achievable level.
- The lower range (last 2 rows) represent not only the worst new products on the market, but also provide consumers with a reference to the existing products currently in use.

Denomination of the rows/ classes is to be decided. At this stage 'Better than A' products are shown as A+/A++/A+++

II.2 Structure of Implementing Directive

II.2.1 The Label shall include the following information:

- 1) Manufacturer
- 2) Model identification
- 3) Energy efficiency Rating
- 4) Function (Water Heater)
- 5) Size category (Water heater load)

Possibles

- 6) Indication of night current use, smart control, etc.
- 7) NOx rating (e.g. 'Low-Nox' if appliance complies with 2013 levels)
- 8) Noise
- 9) Annual energy consumption in primary (gas/Oil) energy in MJ
- 10) Annual energy consumption in secondary (electric) energy in kWh
- 11) Technology (storage, instantaneous, HP)

II.2.2 The Fiche shall include the following information:

- 1) The label (with energy efficiency Rating)
- 2) The information Fiche /Technical input sheet form (Data report CH-Boilers & Water Heaters from annex B1. general of the Annex IV)
- 3) NOx rating

II.2.3 Installers, mail order catalogues and internet sellers shall provide the fiche information with their offer, including the following information

- 1) The label (with energy efficiency Rating)
- 2) NOx Rating

Annex III

Installation requirements for Water heaters (*Illustrative – EPBD*)

III.1 Installation Requirements

From [1 January 2013]

Member states shall

- Introduce, under certain conditions (see III.2) more stringent minimum energy efficiency limits:
 - From 01/01/2013 :
 - In new buildings : Minimum B class for M, L and XL loads
 - Ensure correct sizing of Water Heaters
 - From 01/01/2015 :
 - In new buildings : Minimum A class for all loads
 - Whenever a water heater is replaced Minimum B class (A for XXL, 3XL and 4XL) except when it is '*not technically, functionally or economically feasible to meet this limit*'.

- Only set energy efficiency limits for the installation of water heaters or for water heating systems that are consistent with the thresholds in Annex I (Ecodesign) and II (Energy Labelling). Thus, for any given hot water system, the only (energy efficiency) requirement on the water heater is that it is of a certain size(s) and meets certain thresholds. Thus, this is without prejudice to rules relating to other elements of the system (e.g. insulation of pipes) or rules relating to the choice between local and distributed systems.

III.2 Conditions for higher energy efficiency limits obligation

Example of where it might not be *technically, functionally or economically feasible to meet the minimum requirements*

- Possible derogations for Member States, for :
 - Technological reasons (major difficulties or impossibility to install)
 - Economical reasons (too high installation costs...)
 - National political reasons (promotion of one specific type of energy, etc.)

Member States can also decide for some specific reasons to postpone introduction of minimum efficiency criteria.

- EPBD revision could provide conditions where ban of EWH should not take place:

- If there is need to choose a fuel not already available
- If the dwelling is equipped with advanced ventilation control (SWHP using exhaust air should not be allowed)
- If local rules are prohibiting external elements (historical centres for example) would cause problems.
- If the WH has to be installed in the “living volume” and the alternative technology, to be installed at same place, has a noise level > 43 dB (or > 35 dB if installed in sleeping room)
- If an outside air SWHP has to be installed in a place where installation oblige to go through more than one wall

III.3 Decentralized water heaters

- Considering high level of energy saving potential by using as often as possible decentralized sanitary hot water production, EPBD should provide rules on the choice between centralized and decentralized water heating that take full account of the differences in distribution losses due for example to longer pipe lengths in centralized systems.

○

III.4 Building Certificate, inspection

Consideration is being given to extending the EPBD requirements for Building energy certificates, or boiler inspection. The idea would be to require an estimate of the energy saving potential and installation cost of upgrading the current water heater (boiler) with either an 'A' level product, or one meeting the minimum energy requirement.