Nordsyn – ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters
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*Nordic co-operation* has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

*Nordic co-operation* seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world’s most innovative and competitive.

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Nordsyn – ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters

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The European Commission published four regulations concerning ecodesign and energy labelling requirements of appliances for space heating and water heating (Regulations: 811/2013, 812/2013, 813/2013 and 814/2013) in the Official Journal 6th of September 2013. The first requirements will apply from 26 September 2015.

In January 2015, the Commission published a guideline on these regulations that contains a section with frequently asked questions (FAQ). Only the regulations are legally binding – the guideline itself is not. However, it is helpful for better understanding the regulations. It is available here: https://ec.europa.eu/energy/sites/ener/files/documents/GuidelinesSpaceWaterHeaters_FINAL.pdf

The Nordic market surveillance authorities have issued a series of fact sheets/guides to help manufacturers and importers of appliances prepare for the new requirements. Four of these fact sheets have been developed by Nordsyn, which is a Nordic cooperation aiming for more efficient market surveillance of ecodesign and energy labelling. Nordsyn’s partners are the Swedish Energy Agency/Energimyndigheten, the Danish Energy Agency/Energistyrelsen, the Finnish Safety and Chemicals Agency/Tukes, the Norwegian Water Resources and Energy Directorate/Norges vassdrags-og Energidirektorat, and the Iceland Construction Authority/Mannvirkjastofnun.

- “Fact sheet on ecodesign and energy labelling requirements for electric heat pumps and electric boilers”.
- “Fact sheet on ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters”.
- “Fact sheet on ecodesign and energy labelling requirements for hot water storage tanks”.
- “Fact sheet on energy labelling requirements for packages of water heaters and solar devices”.

The Norwegian Water Resources and Energy Directorate (NVE) has also developed two additional fact sheets:

- “Fact sheet on ecodesign and energy labelling requirements for oil- and gas-fired boilers”.
- “Fact sheet on energy labelling requirements for packages of space heaters/combination heaters, temperature controls and solar devices”.

Together, these fact sheets cover the most common space and water heating appliances on the Nordic market. However, some appliances are not covered by these regulations, e.g. micro CHP appliances and gas-fired water heaters. The individual fact sheets refer to one another when relevant and it is therefore recommended to have them all in order to gain their full benefit.

The fact sheets summarise the contents of the Regulations and are addressed to manufacturers, importers and other interested parties. The fact sheets are not
legally binding and they do not substitute the Regulations and, in the event of doubt, the Regulations are applicable (any binding interpretation can only be made by the EU court). The fact sheets have been developed by the Danish Technological Institute and Viegand Maagøe A/S, Denmark, as part of Nordsyn and of the Nordic Prime Ministers’ overall green growth initiative: The Nordic Region – leading in green growth under the Nordic Council of Ministers – read more at www.nordicway.org or at www.norden.org/greengrowth

October 2015
Are you a manufacturer or importer of electric heat pump water heaters and electric conventional water heaters?

Please be aware that there are new requirements for energy efficiency, maximum sound power levels and energy labelling. Electric water heaters and heat pump water heaters must meet the ecodesign requirements. This means that the product is designed in order to meet, for example, minimum energy efficiency requirements and maximum permissible sound power levels.

Electric water heaters and heat pump water heaters must also be energy labelled.

**Which products?**

The Ecodesign Regulation applies to:

- Electric water heaters and heat pump water heaters with a rated output up to and including 400 kW.

**When?**

The requirements for energy labelling and ecodesign both apply from 26 September 2015.

The ecodesign regulations for electric water heaters and heat pump water introduce requirements for:

- Water heating energy efficiency for electric water heaters and heat pump water heaters with a rated output up to and including 400 kW. The requirements will be tightened from 26 September 2017 and again from 26 September 2018.
- Storage capacity for storage water heaters.
- Maximum permissible sound power levels.
- Information on the properties of electric water heaters and heat pump water heaters for space heating and combined space and water heating.

The energy labelling regulations for electric water heaters and heat pump water heaters introduce requirements for:

- The provision of a printed EU energy label and a product fiche.
- Information on the energy class in advertisements and technical promotion material.
- The provision of electronic versions of the EU energy label and product fiche to dealers for products placed on the market with a new model identifier.
- The display of the energy label and product fiche when the products are offered for sale through the internet.

**Who?**

You are responsible for ensuring and documenting compliance with the requirements, if you are:

- A manufacturer in the EEA producing water heaters or heat pump water heaters to be placed on the market in the EEA.
- An importer of water heaters or heat pump water heaters from
a country outside the EEA to be placed on the market in the EEA.
• An authorised representative in the EEA for a manufacturer that is situated in a country outside the EEA.

The responsible parties mentioned above are hereinafter referred to as suppliers.

Dealers of water heaters and heat pump water heaters are responsible for ensuring that the energy label provided by the supplier is clearly visible on each product at the point of sale. There are also requirements for the energy labelling of packages consisting of electric water heaters and solar devices, see the “Fact sheet on energy labelling requirements for packages of water heaters and solar devices”.

The EEA (European Economic Area) includes the EU member states and the EFTA countries.

Why?
Electric water heaters and heat pump water heaters account for a large share of energy consumption in European households. Consequently, the EU has decided to reduce the energy consumption for electric water heaters and heat pump water heaters by introducing requirements for energy efficiency and by introducing energy labelling with energy classes.

Where can I find more information?
You can find the relevant regulations on the last page of this fact sheet, or read more about ecodesign and energy labelling on the webpages of the national market surveillance authorities and the Commission (https://ec.europa.eu/energy/en/topics/energy-efficient-products/heaters).

Disclaimer
This fact sheet presents the contents of the Regulations and is addressed to manufacturers, importers and other interested parties. This fact sheet is not legally binding and does not substitute the Regulations. In the event of doubt, the Regulations are applicable, and any binding interpretation can only be made by the EU court.
Which products must comply with the requirements?

**Electric waters heaters and heat pump water heaters**
From 26 September 2015, the ecodesign requirements will apply to electric water heaters and heat pump water heaters with a rated output ≤ 400 kW. The requirements also apply if the electric water heater or the heat pump water heater is part of a package together with other products for water heating.

The requirements described in these fact sheet do not apply to:

- Combination heaters as defined in Article 2 of Commission Regulation (EU) No 813/2013.
- Water heaters that do not meet at least the load profile with the smallest reference energy, as specified in the regulation.
- Water heaters designed for making hot drinks and/or food only.
- Heat generators designed for water heaters and water heater housings to be equipped with such heat generators placed on the market before 1 January 2018 to replace identical heat generators and identical water heater housings. The replacement product or its packaging shall clearly indicate the water heater for which it is intended.

The requirements for energy labelling of electric water heaters and heat pump water heaters only apply to electric water heaters and heat pump water heaters with a rated output ≤ 70 kW.

*Figure 1: Different types of water heating system*
The water heater generates and transfers heat to deliver drinking or sanitary hot water. The water heater is connected to an external supply of drinking or sanitary water and is equipped with one or more heat generators. The heat generator of the electric water heater is an electric resistance heating element, whereas the heat pump of the heat pump water heater generates heat by capturing ambient heat from an air source, water source or ground source, and/or waste heat. The storage water heater is a water heater equipped with hot water storage tank(s), heat generator(s) and possibly other parts, which are contained in a single housing.

A distinction is made between water heaters and hot water storage tanks. The hot water storage tank is a vessel for storing hot water for water and/or space heating purposes, including any additives, which is not equipped with any heat generator, except possibly one or more back-up immersion heaters. The back-up immersion heater is an electric resistance heater that is part of a hot water storage tank and generates heat only when the external heat source is disrupted (including during maintenance periods), or out of order, or that is part of a solar hot water storage tank and provides heat when the solar heat source is not sufficient to satisfy required comfort levels.

Figure 1 outlines three different types of water heating systems: a) is a water heater for, example an electric water heater or heat pump water heater, b) is characterized as a space heater that also supplies a hot water storage tank, c) is a combination heater. Besides providing space heating, combination heaters must also be designed to supply hot water and to be connected to an external water supply. There are separate ecodesign and energy labelling requirements for hot water storage tanks and combination heaters, see the “Fact sheet on ecodesign and energy labelling requirements for hot water storage tanks”, “Fact sheet on ecodesign and energy labelling requirements for electric heat pumps and electric boilers” and “Fact sheet on ecodesign and energy labelling requirements for oil- and gas-fired boilers”.

The water heater can be equipped with a smart control, i.e. a device that automatically adapts the water heating process to individual usage conditions with the aim of reducing energy consumption.
What are the requirements for energy labelling?

From 26 September 2015, electric water heaters and heat pump water heaters must be labelled with the EU energy label. The label is identical in all the EU/EEA countries and includes pictograms instead of text, so that the label can be easily understood in all countries.

The supplier is responsible for providing the energy label together with each heat pump or heat pump water heater.

**Energy efficiency classes on the label**
The label for electric water heaters and heat pump water heaters includes a single scale, and energy classes will be introduced in two stages according to the schedule in Table 1. From 26 September 2015 an energy label with energy classes from A to G is required, and from 26 September 2017 a label with energy classes from A++ to F is required.

**Determination of the energy classes**
The energy label for water heating is based on the water heating energy efficiency ($\eta_{WH}$), which is an expression of the supplied hot water in relation to energy input for a given consumption load profile.

The load profiles are adjusted to various water consumption needs and are described by size categories ranging from XS to XXL. The load profiles are described by a number of “water draw-offs” and the requirements for water temperature and flow are spread over a day from 7:00 a.m. to 10:00 p.m. with defined intervals.

Water heating energy efficiency is calculated on the basis of tests at a load profile that fits the water heater’s hot water production capacity.

All electricity input is multiplied with the conversion coefficient $CC = 2.5$, which reflects the power production’s estimated average efficiency of 40% in the EU.

Methods of measurement and calculation of the various factors are described in Regulation EU No 812/2013, Annex VII. Harmonised methods will be published in the second half of 2015 at the earliest. Until then, measurements and calculations should be performed according to the transitional methods published by the Commission.

**Be aware:**
The actual measurement results without addition of tolerances must be used for declaration of the energy efficiency class and other required declarable values.

### Table 1: Plan for the introduction of energy classes

<table>
<thead>
<tr>
<th>Energy classes</th>
<th>Energy label from</th>
</tr>
</thead>
<tbody>
<tr>
<td>A–G</td>
<td>26 September 2015</td>
</tr>
<tr>
<td>A++–F</td>
<td>26 September 2017</td>
</tr>
</tbody>
</table>
Information on the energy label
Labels must include information on the water heater’s energy class, the related load profile, annual electricity consumption (final), and sound power level. For heat pump water heaters, the annual electricity consumption under cold or hot climate conditions (similar to the climate in Helsinki and Athens) must also be declared. The label must provide a temperature map of Europe with the three guiding climate zones.

Moreover, information on water heating energy class, load profile and ability to operate only during off-peak operation must be declared. Off-peak operation is if the energy input is provided outside the draw-off period, i.e. between 10:00 p.m. and 7:00 a.m.

Energy label for conventional electric water heaters
Energy labels with energy classes according to the two stage introduction for conventional electric water heaters. The label to the left is required from stage one, i.e. 2015. The label to the right is required from stage two, i.e. 2017.
Energy label for heat pump water heaters

Energy labels with energy classes according to the two stage introduction for heat pump water heaters. The label to the left is required from stage one, i.e. 2015. The label to the right is required from stage two, i.e. 2017.

Energy classes

For water heating the connection between energy class for a given load profile and water heating energy efficiency is as shown in Table 2.
Table 2: Energy classes for water heating

<table>
<thead>
<tr>
<th></th>
<th>3XS</th>
<th>XXS</th>
<th>XS</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>XXL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A++</td>
<td>53 ≤ η_{wh}</td>
<td>62</td>
<td>61 ≤ η_{wh}</td>
<td>69</td>
<td>72 ≤ η_{wh}</td>
<td>90</td>
<td>130 ≤ η_{wh}</td>
<td>163</td>
</tr>
<tr>
<td>A+</td>
<td>44 ≤ η_{wh}</td>
<td>53</td>
<td>53 ≤ η_{wh}</td>
<td>61</td>
<td>55 ≤ η_{wh}</td>
<td>72</td>
<td>100 ≤ η_{wh}</td>
<td>130</td>
</tr>
<tr>
<td>A</td>
<td>35 ≤ η_{wh}</td>
<td>44</td>
<td>38 ≤ η_{wh}</td>
<td>53</td>
<td>38 ≤ η_{wh}</td>
<td>55</td>
<td>65 ≤ η_{wh}</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>32 ≤ η_{wh}</td>
<td>35</td>
<td>35 ≤ η_{wh}</td>
<td>38</td>
<td>35 ≤ η_{wh}</td>
<td>38</td>
<td>39 ≤ η_{wh}</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>29 ≤ η_{wh}</td>
<td>32</td>
<td>32 ≤ η_{wh}</td>
<td>35</td>
<td>32 ≤ η_{wh}</td>
<td>35</td>
<td>36 ≤ η_{wh}</td>
<td>50</td>
</tr>
<tr>
<td>D</td>
<td>26 ≤ η_{wh}</td>
<td>29</td>
<td>29 ≤ η_{wh}</td>
<td>32</td>
<td>29 ≤ η_{wh}</td>
<td>32</td>
<td>33 ≤ η_{wh}</td>
<td>36</td>
</tr>
<tr>
<td>E</td>
<td>22 ≤ η_{wh}</td>
<td>26</td>
<td>26 ≤ η_{wh}</td>
<td>29</td>
<td>26 ≤ η_{wh}</td>
<td>29</td>
<td>30 ≤ η_{wh}</td>
<td>33</td>
</tr>
<tr>
<td>F</td>
<td>19 ≤ η_{wh}</td>
<td>22</td>
<td>23 ≤ η_{wh}</td>
<td>26</td>
<td>23 ≤ η_{wh}</td>
<td>26</td>
<td>27 ≤ η_{wh}</td>
<td>30</td>
</tr>
<tr>
<td>G</td>
<td>η_{wh} &lt; 19</td>
<td></td>
<td>η_{wh} &lt; 20</td>
<td></td>
<td>η_{wh} &lt; 23</td>
<td></td>
<td>η_{wh} &lt; 27</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

η_{wh} = Efficiency ratio of water heating.
What are the requirements for ecodesign?

From 26 September 2015 electric water heaters and heat pump water heaters must meet the minimum requirements for the water heating energy efficiency. The requirements will be tightened from 26 September 2017 and again from 26 September 2018. For the latter only for the largest water heaters.

Requirements for water heating efficiency
The minimum requirements for water heating energy efficiency for electric water heaters and heat pump water heaters will be introduced in three stages. Tables 3, 4 and 5 show the minimum requirements from 26 September 2015, and the tightened requirements from 26 September 2017 and 2018 respectively. Water heating energy efficiency must meet the minimum requirements listed in the tables.

Supplementary requirements on water heating energy efficiency for water heaters equipped with smart control
If the water heater has a smart control, it must fulfill a certain efficiency gain criterion. The criterion is fulfilled if $\text{SCF}^1 \geq 0.07$ (the energy efficiency gain must be at least 7%). In that case, the value of $\text{smart}^2$ must be 1. In all other cases, the value of smart must be 0.

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1 SCF = Smart Control Factor – the water heating efficiency gain due to smart control under the conditions set out in point 3 of Annex II in COMMISSION REGULATION (EU) No 814/2013.
2 smart = smart control compliance – the measure of whether a water heater is equipped with a smart control fulfills the criterion set out in point 4 of Annex IV in COMMISSION REGULATION (EU) No 814/2013 (the value is set to 1 or 0).
In addition to the requirements listed in Tables 3, 4 and 5, a water heater equipped with a smart control with a value \( \text{smart} = 1 \) must also fulfill the requirements in Tables 6 and 7. These requirements must be fulfilled with a value \( \text{smart} = 0 \) and they have been introduced to secure a certain level of minimum water heating efficiency in the event that the consumer turns off the smart control.

**Requirements on storage water heaters capacity**

From 26 September 2015, storage water heaters must fulfill certain requirements related to the declared load profile.

The storage volume for storage water heaters with declared load profiles 3XS, XXS, XS and S applies must not exceed the values in Table 8.

**Table 6: Requirements for water heating energy efficiency for water heaters with smart control (\( \text{smart}=1 \)), calculated with the value \( \text{smart}=0 \) from 26 September 2015**

**Table 7: Requirements for water heating energy efficiency for water heaters with smart control (\( \text{smart}=1 \)), calculated with the value \( \text{smart}=0 \) from 26 September 2017**

**Table 8: Maximum storage volume for storage water heaters with declared load profiles 3XS, XXS, XS and S**

<table>
<thead>
<tr>
<th>Declared load profile</th>
<th>Maximum storage volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>3XS</td>
<td>7 litres</td>
</tr>
<tr>
<td>XXS og XS</td>
<td>15 litres</td>
</tr>
<tr>
<td>S</td>
<td>36 litres</td>
</tr>
</tbody>
</table>
Requirements for the amount of mixed water at 40 °C available at the end of a water heating energy efficiency test are applicable for storage water heaters with declared load profiles M, L, XL, XXL, 3XL and 4XL. These requirements aim to ensure that the storage water heaters can deliver a certain level of comfort. The amount of mixed water at 40 °C shall must fall below the values in Table 9.

**Requirements for sound power level**
From 26 September 2015, the sound power level for heat pump water heaters must not exceed the values in Table 10.

**Miscellaneous**
Methods for measurement and calculation of the various factors are described in Regulation EU No 812/2013, Annex III. The methods are the same as the ones used for energy labelling. Harmonised methods will be published at the earliest in the second half of 2015. Until then, measurements and calculations should be performed according to the transitional methods published by the Commission.

In addition, both heat generators designed for a supply system and water heater housings designed to be equipped with such heat generators must be tested with an appropriate water heater housing and heat generator, respectively.

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**Table 9: Requirements on the minimum amount of mixed water at 40 °C.**

<table>
<thead>
<tr>
<th>Declared load profile</th>
<th>M</th>
<th>L</th>
<th>XL</th>
<th>XXL</th>
<th>3XL</th>
<th>4XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed water at 40 °C</td>
<td>65</td>
<td>130</td>
<td>210</td>
<td>300</td>
<td>520</td>
<td>1 040</td>
</tr>
</tbody>
</table>

**Table 10: Maximum permissible sound power level for electric water heater from 26 September 2015**

<table>
<thead>
<tr>
<th>Rated heat output ≤ 6 kW</th>
<th>Sound power level (l_{WA}), indoors</th>
<th>Sound power level (l_{WA}), outdoors</th>
<th>Sound power level (l_{WA}), indoors</th>
<th>Sound power level (l_{WA}), outdoors</th>
<th>Sound power level (l_{WA}), indoors</th>
<th>Sound power level (l_{WA}), outdoors</th>
<th>Sound power level (l_{WA}), indoors</th>
<th>Sound power level (l_{WA}), outdoors</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 dB</td>
<td>65 dB</td>
<td>65 dB</td>
<td>70 dB</td>
<td>78 dB</td>
<td>80 dB</td>
<td>88 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 9** Requirements on the minimum amount of mixed water at 40 °C.

**Table 10** Maximum permissible sound power level for electric water heater from 26 September 2015
What are the requirements for information and documentation?

Energy labelling

**Energy label and product fiche**
All electric water heaters and heat pump water heaters placed on the market from 26 September 2015 must be provided with a printed energy label and a product fiche. A product fiche may include several models of electric water heaters and heat pump water heaters from the same supplier, see the guidelines for product fiches in the Regulation on Energy Labelling, 812/2013 Annex IV.

Furthermore, electronic versions of the energy label and the product fiche must be made available to dealers for products placed on the market with a new model identifier. The layout of the electronic energy label must be identical with the printed label and the electronic versions of the label and the fiche must include the same information as the printed versions.

**Information in technical promotion material and in advertisements**
Relevant technical promotion material and advertisements for electric water heaters and heat pump water heaters shall include information on the energy class of the units. Further information is available in Regulation 812/2013/ EU, Article 3 and 4.

**Labelling on the internet**
The electronic energy label and product fiche must be shown on the display in proximity to the price when heat pumps and electric boilers are offered for sale or hire through the internet. The label and the product fiche may be shown using a “nested display”.

**Ecodesign**

**CE marking and EC declaration of conformity**
Electric water heaters and heat pump water heaters covered by the ecodesign requirements must be CE marked when they are placed on the market in the EU/EEA countries.

Furthermore, an EC declaration of conformity must be available from which is must appear that the product complies with the requirements of the Regulation. Consequently, the reference number of Regulation EU No 814/2013 must be mentioned in the declaration of conformity.

You can find the requirements for the contents of an EC declaration of conformity in the Ecodesign Directive 2009/125/EC Annex VI.

**Ecodesign and energy labelling**

**Technical documentation**
The supplier is responsible for making sure that the electric water heater or heat pump water heater has technical documentation when it is placed on the EEA market. The technical documentation must show that the electric water heater or heat pump water heater is constructed in conformity with the ecodesign requirements and that the energy labelling of the electric water heater or heat pump water heater is correct. The technical documentation must be compiled by the manufacturer.
For all electric water heaters or heat pump water heaters, you can see the requirements for technical documentation and information to be made available on the manufacturer's website in Regulation 812/2013/EU Annex V and Regulation 814/2013/EU Annex II.

The market surveillance authorities of EEA countries may request the technical documentation, and you must provide it within a maximum of ten days after receiving the request.

The documentation relating to ecodesign requirements must be stored for a period of ten years after the last model of that product has been manufactured. In the case of energy labelling requirements, the documentation must be stored for five years.

**Measurement and calculation methods**

Reliable, accurate and reproducible measurement methods based on generally accepted measurement techniques must be used. A reproducible measurement method means that the measurements can be repeated with the same result.

Measurements must always be carried out in accordance with the Regulations.
Where can I find information?

The webpages of the national market surveillance authorities and the Commission (https://ec.europa.eu/energy/en/topics/energy-efficient-products/heaters) contain more information about policies, new regulatory requirements, guidance, contact information, and links to relevant legislation.

Legislation


DIRECTIVE 2010/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (recast).


Where can I find help and guidance?

You can get help to understand the requirements and answers to your questions by contacting your national market surveillance authorities for ecodesign and energy labelling.