

# Guide to ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters

## Preface

The European Commission has published in the Official Journal 6<sup>th</sup> of September 2013 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). The first requirements will apply from 26<sup>th</sup> September 2015.

In order to prepare manufacturer and importers of appliances for the new requirements a number of guides are developed. Four guides are developed in the frame of the Nordic surveillance cooperation for green products (Nordsyn):

- 'Guide to ecodesign and energy labelling requirements for electric heat pumps and electric boilers'
- 'Guide to ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters'
- 'Guide to ecodesign and energy labelling requirements of hot water storage tanks'
- 'Guide to energy labelling requirements for packages of water heater and solar device'

In addition, two guides are provided by the Norwegian Water Resources and Energy Directorate (NVE):

- 'Guide to ecodesign and energy labelling requirements of oil- and gas-fired boilers'
- 'Guide to energy labelling requirements of packages of space heaters/combo heaters, temperature controls and solar devices'

Together, these guides cover the most common space and water heating appliances on the market in the Nordic countries. However, they do not cover all appliances comprised by the above mentioned regulations as for instance micro CHP appliances and gas-fired water heaters are not covered.

The individual guides use cross-referencing to the other guides when relevant. Therefore, it is recommended to have all guides available for the full benefits.

The guides present the contents of the Regulations and are addressed to manufacturers, importers and others interested. The guides are not a substitution for the Regulations, in any case of doubt, the Regulations are applicable. The guides are not legally binding as a binding interpretation can only be made by the EU court.

The guides are developed by Danish Technological Institute and Viegand Maagøe consultants, Denmark.

March 2014

# Guide to ecodesign and energy labelling requirements for electric heat pump water heaters and electric conventional water heaters

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

**Please be aware. There are new requirements for energy efficiency, maximum sound power level 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 e.g. 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

The Energy Labelling Regulations applies to:

- Electric water heaters and heat pump water heaters for space heating with a rated output up to and including 70 kW

Other products for water heating are also covered by the ecodesign and energy labelling regulations.

### When?

The ecodesign requirements for electric water heaters and heat pump water heaters include:

- From 26 September 2015 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
- From 26 September 2015 requirements for storage capacity for storage water heaters
- From 26 September 2015 requirements for maximum permissible sound power level
- From 26 September 2015 requirements for information with regard to the properties of electric water heaters and heat pump water heaters for space heating and combined space and water heating

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

- Provision of printed EU energy label and product fiche from 26<sup>th</sup> September 2015
- Information on the energy class in advertisements and in technical promotion material from 26<sup>th</sup> September 2015 for new products placed on the market
- Making electronic versions of the EU energy label and product fiche available to dealers from 26<sup>th</sup> September 2015
- Display of the energy label and product fiche when the products are offered for sale through the internet

## Who?

You have the responsibility of ensuring and documenting compliance with the requirements, if you are:

- a manufacturer in the EEA, that produces heat pumps or electric boilers to be placed on the market in the EEA
- an importer of heat pumps or electric boilers from a country outside of 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 of EEA

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

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

## Why?

The electric water heaters and heat pump water heaters account for a large share of the energy consumption in the European households. Consequently, 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 new energy classes.

### Where can I find more information?

Find relevant regulations on the last page of this guide, or read more about ecodesign and energy labelling on [www.ens.dk/energikrav](http://www.ens.dk/energikrav)

### Disclaimer

This guide presents the contents of the Regulations and is addressed to manufacturers, importers and others interested. The guide is not a substitution for the Regulations, in any case of doubt, the Regulations are applicable. This guide is not legally binding as a binding interpretation can only be made by the EU court.

### Acknowledgement

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**norden**

Nordic Council of Ministers

## Which products must comply with the requirements?

### Electric water heaters and heat pump water heaters

Ecodesign requirements for electric water heaters and heat pump water heaters with a rated output  $\leq 400$  kW will come into force. This also applies 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 guidelines do not apply to:

- Combination heaters as defined in Article 2 of Commission Regulation (EU) No 813/2013 ( 2 )
- Water heaters which 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  $\leq 70$  kW.

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 is generating the 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 heater. 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 is also supplying a hot water storage tank, c) is a combination heater. Besides providing space heating, the combination heaters must also be designed for supplying hot water and for connection to an external water supply. For hot water storages tanks and combination heaters there are separate requirements for ecodesign and energy labelling, see the 'Guide to ecodesign and energy labelling requirements of hot water storage tanks', 'Guide to ecodesign and energy labelling requirements for electric heat pumps and electric boilers and 'Guide to ecodesign and energy labelling requirements of oil- and gas-fired boilers'.

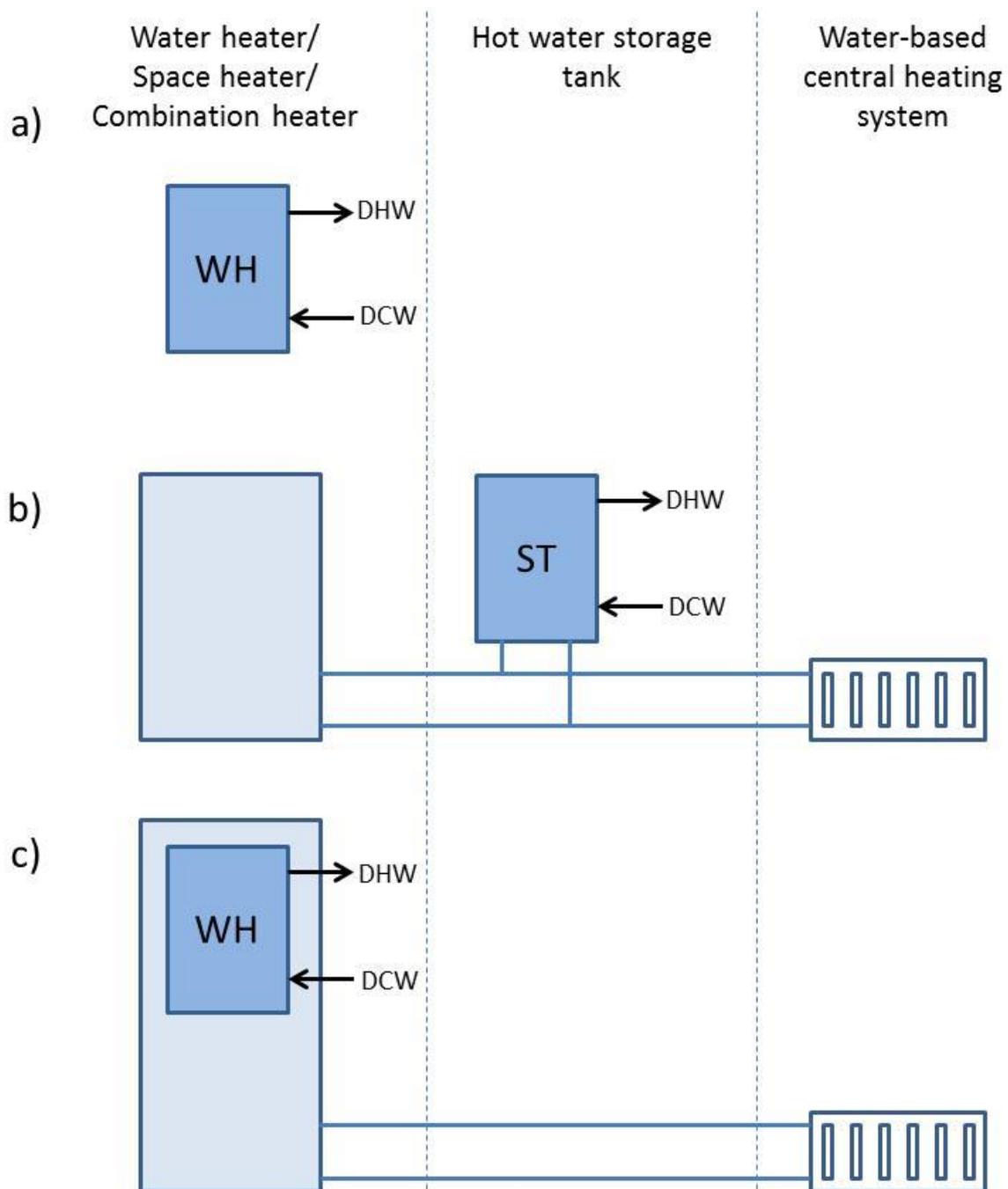


Figure 1 Different types of water heating system.

The water heater can be equipped with smart control, a device that automatically adapts the water heating process to individual usage conditions with the aim of reducing energy consumption.

There are also requirements for energy labelling of packages consisting of electric water heaters and solar devices. 'Guide to energy labelling requirements for packages of water heater and solar device' describes the requirements.

### What are the requirements for energy labelling?

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 is easy to understand in all the countries.

The label has the recognizable red and green arrows and the A-G scale is expanded with the energy classes A<sup>+</sup>, A<sup>++</sup> and A<sup>+++</sup>.

It is the responsibility of the supplier to provide the energy label together with the heat pump or heat pump water heater.

### Energy efficiency classes on the label

The label for electric water heater and heat pump water heaters includes one single scale, and energy classes will be introduced in two steps 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 A<sup>+</sup> to F is required.

Energy classes	Energy label from
A - G	26 September 2015
A <sup>+</sup> - F	26 September 2017

Table 1 Plan for the introduction of energy classes

### Determination of the energy classes

The energy label for water heating is based on 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-off's' and the requirements for water temperature and flow are spread over a day from 7:00 a.m. to 22:00 p.m. with defined intervals.

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

For all electricity input is multiplied with the conversion coefficient  $CC = 2.5$  which reflect the power production's estimated average efficiency of 40 % in the EU.

Methods of measurement and calculation of the various factors are described in the Regulation EU No 812/2013, Annex VII.

#### Be aware:

It is the actual measurement results without addition of tolerances that must be used for declaration of the energy efficiency class and other required declarable values.

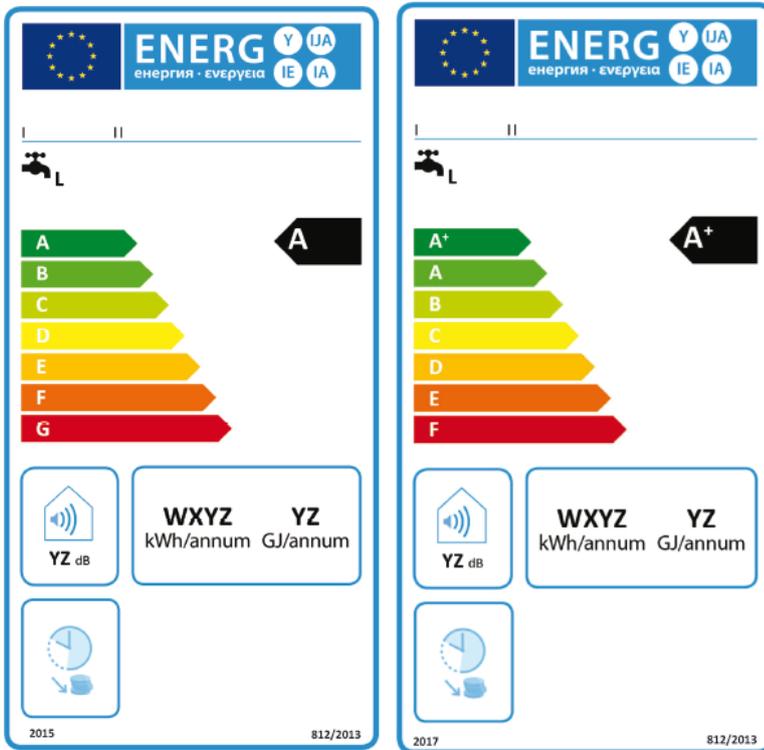
### Information on the energy label

Labels shall include information on the water heater's energy class and the related load profile, annual electricity consumption (final) as well as sound power level. In addition, for heat pump water heaters, the annual electricity consumption under cold or hot climate conditions (similar to the climate in Helsinki and Athens) must 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 22:00 p.m. and 7:00 a.m.

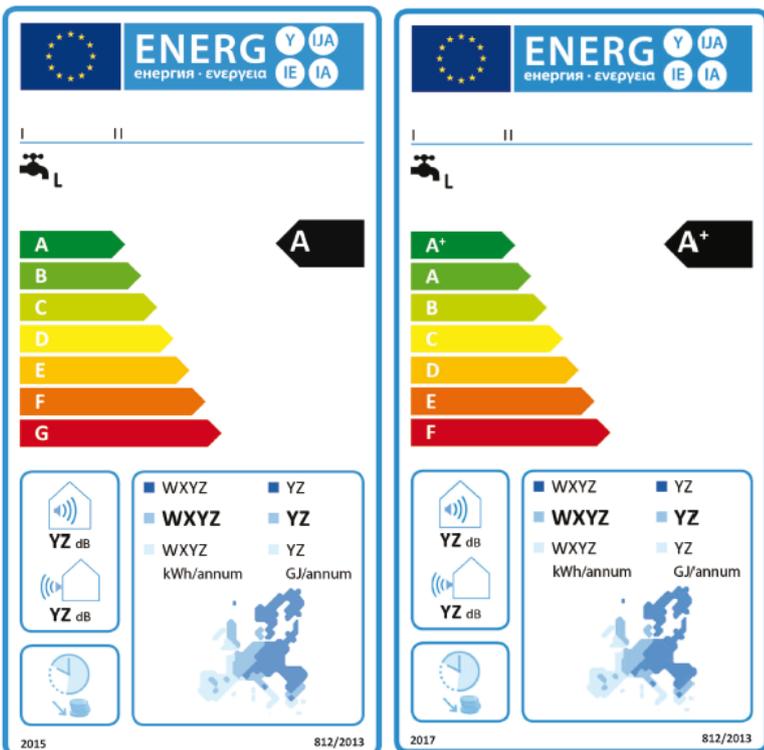
**Energy label for electric water heaters:**

Energy labels with energy classes according to the two step introduction.



**Energy label for heat pump water heaters:**

Energy labels with energy classes according to the two step introduction.



## 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.

	3XS	XXS	XS	S	M	L	XL	XXL
A <sup>+++</sup>	$\eta_{wh} \geq 62$	$\eta_{wh} \geq 62$	$\eta_{wh} \geq 69$	$\eta_{wh} \geq 90$	$\eta_{wh} \geq 163$	$\eta_{wh} \geq 188$	$\eta_{wh} \geq 200$	$\eta_{wh} \geq 213$
A <sup>++</sup>	$53 \leq \eta_{wh} < 62$	$53 \leq \eta_{wh} < 62$	$61 \leq \eta_{wh} < 69$	$72 \leq \eta_{wh} < 90$	$130 \leq \eta_{wh} < 163$	$150 \leq \eta_{wh} < 188$	$160 \leq \eta_{wh} < 200$	$170 \leq \eta_{wh} < 213$
A <sup>+</sup>	$44 \leq \eta_{wh} < 53$	$44 \leq \eta_{wh} < 53$	$53 \leq \eta_{wh} < 61$	$55 \leq \eta_{wh} < 72$	$100 \leq \eta_{wh} < 130$	$115 \leq \eta_{wh} < 150$	$123 \leq \eta_{wh} < 160$	$131 \leq \eta_{wh} < 170$
A	$35 \leq \eta_{wh} < 44$	$35 \leq \eta_{wh} < 44$	$38 \leq \eta_{wh} < 53$	$38 \leq \eta_{wh} < 55$	$65 \leq \eta_{wh} < 100$	$75 \leq \eta_{wh} < 115$	$80 \leq \eta_{wh} < 123$	$85 \leq \eta_{wh} < 131$
B	$32 \leq \eta_{wh} < 35$	$32 \leq \eta_{wh} < 35$	$35 \leq \eta_{wh} < 38$	$35 \leq \eta_{wh} < 38$	$39 \leq \eta_{wh} < 65$	$50 \leq \eta_{wh} < 75$	$55 \leq \eta_{wh} < 80$	$60 \leq \eta_{wh} < 85$
C	$29 \leq \eta_{wh} < 32$	$29 \leq \eta_{wh} < 32$	$32 \leq \eta_{wh} < 35$	$32 \leq \eta_{wh} < 35$	$36 \leq \eta_{wh} < 39$	$37 \leq \eta_{wh} < 50$	$38 \leq \eta_{wh} < 55$	$40 \leq \eta_{wh} < 60$
D	$26 \leq \eta_{wh} < 29$	$26 \leq \eta_{wh} < 29$	$29 \leq \eta_{wh} < 32$	$29 \leq \eta_{wh} < 32$	$33 \leq \eta_{wh} < 36$	$34 \leq \eta_{wh} < 37$	$35 \leq \eta_{wh} < 38$	$36 \leq \eta_{wh} < 40$
E	$22 \leq \eta_{wh} < 26$	$23 \leq \eta_{wh} < 26$	$26 \leq \eta_{wh} < 29$	$26 \leq \eta_{wh} < 29$	$30 \leq \eta_{wh} < 33$	$30 \leq \eta_{wh} < 34$	$30 \leq \eta_{wh} < 35$	$32 \leq \eta_{wh} < 36$
F	$19 \leq \eta_{wh} < 22$	$20 \leq \eta_{wh} < 23$	$23 \leq \eta_{wh} < 26$	$23 \leq \eta_{wh} < 26$	$27 \leq \eta_{wh} < 30$	$27 \leq \eta_{wh} < 30$	$27 \leq \eta_{wh} < 30$	$28 \leq \eta_{wh} < 32$
G	$\eta_{wh} < 19$	$\eta_{wh} < 20$	$\eta_{wh} < 23$	$\eta_{wh} < 23$	$\eta_{wh} < 27$	$\eta_{wh} < 27$	$\eta_{wh} < 27$	$\eta_{wh} < 28$

Table 2 Energy classes for 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 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 are introduced in three steps. Table 3 shows the minimum requirements from 26 September 2015 and the tightened requirements from 26 September 2017 and 2018.

**26 September 2015:**

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

**26 September 2017:**

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

**26 September 2018:**

Declared load profile	XXL	3XL	4XL
Water heating energy efficiency	60 %	64 %	64 %

**Table 3 Requirements for water heating energy efficiency. The water heating energy efficiency should be at least as shown in the table.**

### **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  $SCF^1 \geq 0.07$  (the energy efficiency gain must be at least 7%). In that case, the value of  $smart^2$  shall be 1. In all other cases, the value of smart shall be 0.

A water heater equipped with smart control with a value  $smart = 1$  must in addition to the requirements lined out in table 3 also fulfill the requirements in table 4. These requirements must be fulfilled with the value  $smart = 0$  and has been introduced to secure a certain level of minimum water heating efficiency, if the consumer should turn off the smart control.

<sup>1</sup> 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 the COMMISSION REGULATION (EU) No 814/2013

<sup>2</sup>  $smart$  = smart control compliance - the measure of whether a water heater is equipped with smart control fulfils the criterion set out in point 4 of Annex IV in the COMMISSION REGULATION (EU) No 814/2013 (the value is set to 1 or 0)

**26 September 2015:**

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
In addition, for water heaters with <i>smart</i> being declared as '1': water heating energy efficiency calculated for <i>smart</i> = 0, tested under the declared load profile	19 %	20 %	23 %	23 %	27 %	27 %	27 %	28 %	28 %	28 %

**26 September 2017:**

Declared load profile	3XS	XXS	XS	S	M	L	XL	XXL	3XL	4XL
In addition, for water heaters with <i>smart</i> being declared as '1': water heating energy efficiency calculated for <i>smart</i> = 0, tested under the declared load profile	29 %	29 %	29 %	29 %	33 %	34 %	35 %	36 %	36 %	36 %

Table 4 Requirements for water heating energy efficiency for water heaters with smart control (*smart*=1), calculated with the value *smart*=0.

**Requirements on storage water heaters capacity**

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

For storage water heaters with declared load profiles 3XS, XXS, XS and S applies the storage volume shall not exceed the values of table 5.

Declared load profile	Maximum storage volume
3XS	7 liters
XXS og XS	15 liters
S	36 liters

Table 5 Maximum storage volume for storage water heaters with declared load profiles 3XS, XXS, XS and S

For storage water heaters with declared load profiles M, L, XL, XXL, 3XL and 4XL requirements applies for the amount of mixed water of 40°C available at the end of water heating energy efficiency test. The

requirements shall make sure the storage water heaters can deliver a certain level of comfort. The amount of mixed water at 40 °C shall not fall below the values in table 6.

Declared load profile	M	L	XL	XXL	3XL	4XL
Mixed water at 40 °C	65 litres	130 litres	210 litres	300 litres	520 litres	1 040 litres

Table 6 Requirements on the minimum amount of mixed water at 40 °C

### Requirements for sound power level

From 26 September 2015 heat pump water heaters must meet certain requirements for sound. The sound power level for heat pump water heaters must not exceed the values provided in Table 7.

Rated heat output ≤ 6 kW		Rated heat output > 6 kW and ≤ 12 kW		Rated heat output > 12 kW and ≤ 30 kW		Rated heat output > 30 kW and ≤ 70 kW	
Sound power level ( $L_{WA}$ ), indoors	Sound power level ( $L_{WA}$ ), outdoors	Sound power level ( $L_{WA}$ ), indoors	Sound power level ( $L_{WA}$ ), outdoors	Sound power level ( $L_{WA}$ ), indoors	Sound power level ( $L_{WA}$ ), outdoors	Sound power level ( $L_{WA}$ ), indoors	Sound power level ( $L_{WA}$ ), outdoors
60 dB	65 dB	65 dB	70 dB	70 dB	78 dB	80 dB	88 dB

Table 7 Maximum permissible sound power level for electric water heater from 26 September 2015

### Miscellaneous

Methods for measurement and calculation of the various factors are described in the Regulation EU No 812/2013, Annex III. The methods are the same as the ones used for energy labelling.

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

## 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 of energy labelling, Annex IV.

Furthermore, electronic versions of the energy label and the product fiche must be made available to dealers for new products placed on the market. 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 the 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 it 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.

Find requirement for the contents of 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 a technical documentation when placing it 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 in 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 in 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 guidelines of the Regulations.

### **Where can I find information?**

Danish Energy Agency's homepage [www.ens.dk/energikrav](http://www.ens.dk/energikrav) contains more information about policies, new requirements in regulations, guidance, contact information and links to relevant legislation.

### **Legislations**

COMMISSION REGULATION (EU) No 814/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water heaters and hot water storage tanks.

DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast).

COMMISSION DELEGATED REGULATION (EU) No 812/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of water heaters, hot water storage tanks and packages of water heater and solar device

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).

#### **Danish legislations with regard to ecodesign**

The ecodesign directive is implemented by the following Danish legislations:

- Lovbekendtgørelse om miljøvenligt design af energirelaterede produkter, nr. 1068 af 15. september 2010
- Bekendtgørelse om miljøvenligt design af energirelaterede produkter, nr. 1274 af 19. november 2010 (only available in Danish)

#### **Danish legislations with regard to energy labelling**

The energy labelling directive is implemented by the following Danish legislations:

- Lov om energimærkning af energirelaterede produkter, nr. 455 af 18. maj 2011
- Bekendtgørelse om energimærkning af energirelaterede produkter, nr. 1026 af 18. maj 2011 (only available in Danish)

### **Where can I find help and guidance?**

You can have your questions answered and help to comply with the requirements by contacting the Secretariat for Ecodesign and Energy Labelling of Products

Telephone: +45 43 30 50 20

Monday to Thursday 9:00 - 16:00

Friday 9:00 - 15:30

E-mail: [sekretariat@eco-energimaerke.dk](mailto:sekretariat@eco-energimaerke.dk)

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More about ecodesign and energy labelling:

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