

Topten Product Criteria Paper on Household dishwashers

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The Project in brief

Topten is part of the international Euro-Topten Plus initiative supported by the European programme Intelligent Energy Europe and several national institutions (energy agencies, WWF, consumer associations, research institutes). On global level, Topten is coordinated by TIG, the Topten International Group. This association promotes to the Topten Charter, TIG statutes and Rules of Procedure (www.topten.eu).

Topten is a service that supports the market for energy efficient products. It aims at making energy efficient products the first choice for consumers, by offering them a user-friendly tool for product comparison and selection. The key element is an online information platform for consumers presenting the most energy efficient appliances currently available in various product categories, including household appliances, office equipment, consumer electronics and cars. Information on energy consumption and performance of products as well as several other characteristics (i.e. brand, model, price, picture) is provided. Product data is based on labels and standardized declarations as well as tests from accepted well-known institutions. The service is independent of manufacturers and retailers.

Consortium

The project is co-ordinated by the Agence de l'Environnement et de la Maitrise de l'Energie (ADEME). The other 19 project partners are:

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Belgium: WWF European Policy Office	BE
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1 Introduction

Criteria papers provide a central tool for the Euro-Topten Plus partners to collect and analyse product data and to establish a national Topten selection. Appropriate selection criteria and technical specifications are a crucial precondition for meaningful and well-accepted Topten websites. The purpose of this criteria paper is to provide a common basis for the definition of technical specifications. Obviously, the range of products differs significantly in European member States in terms of price level, configuration, energy classes and energy consumption corresponding to levels of purchasing power and behavioural aspects (mentality, customs, etc.).

Within the European wide Topten project, an aligned approach for technical specifications for all national Topten websites is aimed at. A high level of uniformity and congruency of the different national websites will enhance the awareness amongst manufacturers. Good quality product data at national level furthermore allows to analyse the situation at European level and to make policy recommendations, which are shown on www.topten.eu.

This paper contains the product specification for Topten dishwashers. Currently on topten.eu built-in and freestanding full-size dishwashers are presented. A product should meet the criteria described in Chapter 4 in order to be listed on www.topten.eu as a Best Available Technology.

If possible, criteria are based on international or European standards. In some cases widely accepted and strictly defined standards are missing – (e.g. for products in the consumer electronics segment). Within the methodology of WP3, it was intended to use the implementation measures of the Ecodesign directive as a basis for the criteria definition. The information in this criteria paper is therefore mainly based on the “Preparatory studies for Eco-design Requirements of EuPs – (Tender TREN/D1/40-2005) LOT 14: Domestic Washing Machines and Dishwashers” and the corresponding implementing measure.

2 Product Definition

This chapter provides an overview of the different dishwasher types and special features.

2.1 Energy Consumption

The energy consumption of household dishwashers is dependent on a number of factors such as the program selected (number of fills and the temperature of the wash and rinse operations), the cold water inlet temperature and the water connection configuration (cold only, hot only or hot and cold) but it can be said that today's dishwashers use less energy for washing than traditional washing by hand. The maximum efficiency is gained if the dishwasher is full loaded.

The main principle used in dishwashers is to pump water and dissolved detergent across a load to remove soil and stains using a combination of mechanical and chemical action. The load items themselves are held stationary in a rack and rotating spray arms direct high pressure water jets across the load items. Electricity is used for heating, pumps, electronics and controls.

Most dishwashers draw in cold water from the household water supply and heat water using an electric element as required throughout the program. Some users connect their dishwasher to hot water (usually where a supply of cheap renewable energy produced hot water is available or where the heat is gained through a renewable energy source) in order to minimize direct electricity consumption of the appliance. Only a few models have dual water connections and can take in hot and cold water as required throughout the program.

Quiet operation, energy and water efficiency, and clean dishes without prerinsing are existing features that are continuously being improved. Research relates specifically to the heating system, drying system, insulation materials, control system and washing cycle time.

2.2 Product Types

A dishwasher is a machine which cleans, rinses and dries dishware, glassware, cutlery and cooking utensils by chemical, mechanical, thermal and electric means.

Dishwashers can be classified according to the following:

- Types
- Load capacity (place settings)

- Features

2.2.1 Types

There are two basic types of dishwashers: built-in or freestanding.

Built-in dishwashers

Built in dishwashers are installed as part of the kitchen fitting and therefore less visible once they are installed. There are several types of built-in machines. Fully integrated models are completely hidden by a door front and have their controls at the top of the dishwasher door. Semi-integrated models are covered by a matching kitchen door up to the height of the drawer line.

At built-under or under-the-counter dishwashers it is possible to remove the cover plate. In-column dishwashers are usually built in at chest height to make loading and unloading as easy as possible.

Built-in dishwashers are usually the standard 60-cm size. They are the most common type of dishwashers and therefore offer the largest variety of models.

Freestanding dishwashers

Freestanding dishwashers offer the greatest flexibility because they can be fitted anywhere there is a water supply. However, the front of the machine stays visible. These models come in full-size (60 cm wide) and slimline (45 cm wide) variants.

2.2.2 Load Capacity (place settings)

The international standard for the capacity of a dishwasher is expressed as standard place settings. According to EN 50242 one place setting consists of a dinner plate, soup plate, dessert plate, glass tumbler, tea cup, saucer, knife, fork, soup spoon, dessert spoon and a teaspoon.

The majority of dishwashers are suitable for fitting into a 60 cm wide gap, commonly referred to as full-size. These generally have the capacity for 12-14 place settings and fit into the standard gap for appliances.

Slimline (45 cm wide) models have the capacity for up to 10 place settings. They are a good option for small households or if there is not much space in the kitchen. The following figure gives an overview of the dishwasher sizes.



Dishwasher sizes		
Dishwasher type	 Standard or full-sized	 Slimline
Width	60cm	45cm
Place settings	12 to 15	8 to 10
Best for	A large family or if you entertain	Smaller households where space is limited
Drawbacks	Items are crammed into machines with 15 place settings, which can affect cleaning	Can be noisier than full-sized models

Figure 1 Dishwasher sizes¹

The capacity should match the size of the household. For small households (1-2 persons) a slimline model should be enough, because the user might otherwise be tempted to run the full-size dishwasher more often than necessary, e.g. when running low on a particular dish or cutlery item. For larger families a full-size dishwasher is better. For efficiency reasons dishwashers should always be fully loaded before running it.

Nowadays dishwashers often offer half-load programmes. The half-load programmes use less water and less energy than a normal cycle, however the savings do not equate to half. So it is better to wait until the dishwasher is full before running it. It is always less efficient to make two half loads than one full load. This should be underlined in the selection and recommendation pages of the national websites.

2.2.3 Features

Further classification can be made through different features. There are a lot of different features available but not all of them make sense concerning energy efficiency. The dishwasher features to consider are described in the following:

¹ Source: Source: <http://www.which.co.uk/home-and-garden/kitchen/reviews/dishwashers/page/features-explained>

Anti-flood device: It prevents flooding in case of a defect dishwasher. "Aqua-stop" for example stops the dishwasher if the hose that fills the appliance with water leaks.

Auto sensor: It adjusts the temperature, water amount and programme duration depending on the kind of dishes and degree of soiling. For efficiency reasons it is important that the dishwasher has an auto sensor (or soil/water sensor).

Energy saving function: At lower temperature and extended running time the same cleaning results are achieved as with high temperature.

Hot Water Supply: Hot water supply ("hot fill") for dishwashers can be both economically and ecologically reasonable provided that the hot water is heated efficiently (e.g. by renewable energy sources, heat pump-heating or district heating (e.g. from renewable energy sources or waste heat)) and that it is possible to appropriately install a warm water pipe. If the "hot fill" hot water is heated to 100% by an electric water heater, this (of course) does not bring any energetic benefits compared to direct warming in the machine. The technology is available on the European market, however, its practical use strongly differs within the European countries.

Soil sensor: It is a feature to sense how much food waste is in the water stream. The food waste is filtered out by fine mesh filters, and is drained as the wash proceeds; once the food waste falls under a defined threshold, the wash cycle stops. The total run time for each load is reduced this way and energy is saved.

Water sensor: It determines how much water is needed according to the soil level. More water is added only if necessary. For light or relatively clean dishes less water is used.

3 Legislations and Labels

3.1 European Label

In 2011 will be a transition phase between the old label EU Directive 92/75/EC and the new label EU No 1059/2010 which will apply from 20 December 2011. During this transition period of one year, the old and the new EU energy labels can coexist. As manufacturers are already allowed to use the new label on their product, these two labels may be available at the same time in the shops.

There are different possibilities to deal with the fact that until the end of 2011 two labels are on the market! In the case of www.topten.eu, only products which refer to the new label are listed Austria also lists products according to the new label but there also is a set criteria for products with the old label in order to support consumers. Additionally we explain the circumstances of the new old label difficulty in a footnote at the bottom of the page. The criteria for the old products focus on the energy consumption of a standard cleaning cycle.

3.2 Future Label

In September 2010, the Regulatory Committee updated the energy labelling directive for dishwashers: COMMISSION DELEGATED REGULATION (EU) No 1059/2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household washing machines. It shall apply from 20 December 2011.

The energy efficiency class of a household dishwasher shall be determined on the basis of its Energy Efficiency Index (EEI). The calculation of the EEI varies significantly in comparison to the old label. The most important changes of the calculation in the EU energy label and as well in the Ecodesign implementing measure are:

- the calculation of the annual energy consumption includes the energy consumption in the "standard cycle", when loaded with the declared place settings, the programme time and also the power in the left-on mode and off-mode.
- the information on the cycle is referred to the standard programme that is suitable to clean normally soiled tableware and that is the most efficient in terms of combined energy and water consumptions.
- the unit of the energy consumption is not kWh/cycle anymore but kWh/year of a set number of cleaning cycles per year (280 cycles/ year).
- the cleaning performance information will not be indicated on the label anymore because class A will be mandatory (see specific ERP requirements below)

The EEI calculation is explained in detail in the labelling directive.

The new energy classes are set out in following table:

Table 1: Energy efficiency classes²

Table 1
Energy efficiency classes

Energy efficiency class	Energy Efficiency Index
A+++ (most efficient)	$EEI < 50$
A++	$50 \leq EEI < 56$
A+	$56 \leq EEI < 63$
A	$63 \leq EEI < 71$
B	$71 \leq EEI < 80$
C	$80 \leq EEI < 90$
D (least efficient)	$EEI \geq 90$

The drying efficiency class of a household dishwasher shall be determined on the basis of its Drying Efficiency Index as set out in the following table:

Table 2: Drying efficiency classes²

Table 2
Drying efficiency classes

Drying efficiency class	Drying Efficiency Index
A (most efficient)	$I_D > 1,08$
B	$1,08 \geq I_D > 0,86$
C	$0,86 \geq I_D > 0,69$
D	$0,69 \geq I_D > 0,55$
E	$0,55 \geq I_D > 0,44$
F	$0,44 \geq I_D > 0,33$
G (least efficient)	$0,33 \geq I_D$

² COMMISSION DELEGATED REGULATION (EU) No 1059/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household dishwashers

3.2.1 Label Scheme

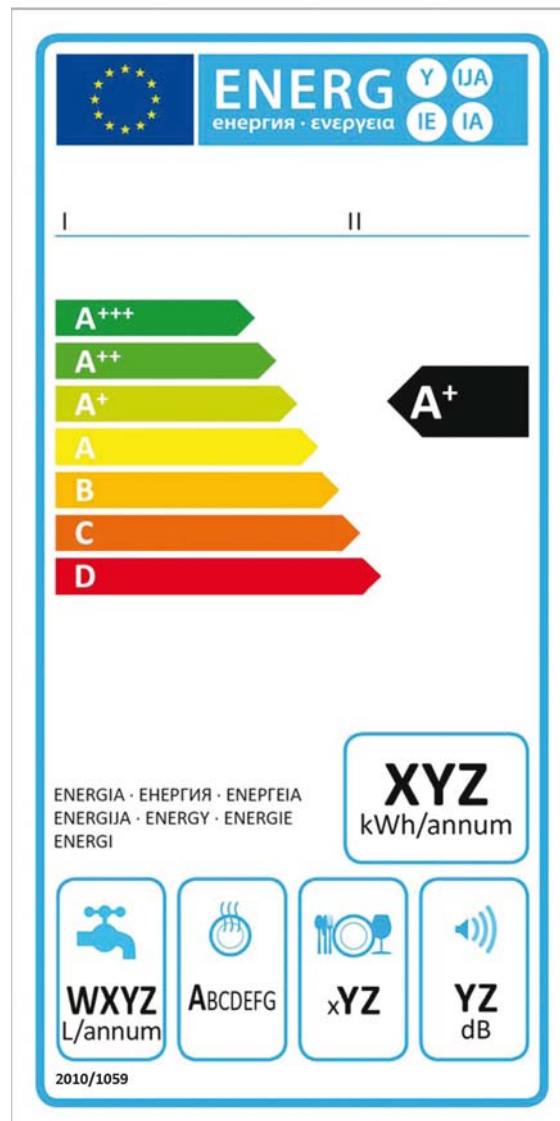


Figure 6: New Label Scheme³

- I. supplier's name or trade mark;
- II. supplier's model identifier, where 'model identifier' means the code, usually alphanumeric, which distinguishes a specific household dishwasher model from other models with the same trade mark or supplier's name;
- III. the energy efficiency class determined in accordance with point 1 of Annex VI; the head of the arrow containing the energy efficiency class of the household dishwasher shall be placed at the same height as the head of the arrow of the relevant energy efficiency class;
- IV. annual energy consumption (AE C) in kWh per year, rounded up to the nearest integer and calculated in accordance with point 1(b) of Annex VII;

³ COMMISSION DELEGATED REGULATION (EU) No 1059/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household dishwashers

V. annual water consumption (AW C) in litres per year, rounded up to the nearest integer and calculated in accordance with point 3 of Annex VII;

VI. the drying efficiency class determined in accordance with point 2 of Annex VI;

VII. rated capacity in standard place settings, for the standard cleaning cycle (14 place settings⁴);

VIII. airborne acoustical noise emissions expressed in dB(A) re 1 pW and rounded to the nearest integer.

3.3 Current Label (until December 2011)

Commission Directive 97/17/EC implements council directive 92/75/EEC with regard to the energy labelling of household dishwashers. Commission Directive 1999/9/EC amends Commission Directive 97/17/EC.

The energy label contains information on:

- the energy efficiency class - with a class from A to G
- energy consumption in kWh per cycle using standard cycle
- cleaning performance class - with a class from A to G
- drying performance class - with a class from A to G
- capacity of appliance in standard place settings
- water consumption per complete cycle using standard cycle in litres
- noise during standard cycle in dB(A)

The label also sets energy efficiency classes through the calculation of an energy efficiency index. The calculation method is explained in detail in the regulation. The following table shows energy efficiency index.

⁴ The more place settings for one washing cycle the better the result of the energy efficiency index will be. The manufacturers therefore strive to place as many place settings as possible within their products to get a better EEI. Please notice that in practise for a normal washing cycle it is hard to place 14 place settings even though the manufacturer has declared it!

Table 3: Energy efficiency index⁵

Energy efficiency class	Energy efficiency index E_I
A	$E_I < 0,64$
B	$0,64 \leq E_I < 0,76$
C	$0,76 \leq E_I < 0,88$
D	$0,88 \leq E_I < 1,00$
E	$1,00 \leq E_I < 1,12$
F	$1,12 \leq E_I < 1,24$
G	$E_I \geq 1,24$

The cleaning performance class of an appliance shall be determined by the following table:

Table 4: Cleaning performance class of an appliance⁶

Cleaning performance class	Cleaning performance index P_C as defined in the harmonized standards referred to in Article 1 (2), using a standard cycle
A	$P_C > 1,12$
B	$1,12 \geq P_C > 1,00$
C	$1,00 \geq P_C > 0,88$
D	$0,88 \geq P_C > 0,76$
E	$0,76 \geq P_C > 0,64$
F	$0,64 \geq P_C > 0,52$
G	$0,52 \geq P_C$

The drying performance class of an appliance shall be determined by the following table:

⁵ COMMISSION DIRECTIVE 97/17/EC of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers

⁶ COMMISSION DIRECTIVE 97/17/EC of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers

Table 5: Drying performance class of an appliance⁶

Drying performance class	Drying performance index P_D as defined in the harmonized standards referred to in Article 1 (2)
A	$P_D > 1,08$
B	$1,08 \geq P_D > 0,93$
C	$0,93 \geq P_D > 0,78$
D	$0,78 \geq P_D > 0,63$
E	$0,63 \geq P_D > 0,48$
F	$0,48 \geq P_D > 0,33$
G	$0,33 \geq P_D$

3.4 European Regulation on Energy Related Products (ERP Directive)

The ERP Directive serves as a basis for the Labelling Directive. Its intention is to set minimum ecodesign requirements for energy related products whereas the Labelling Directive aims to push the market to products that are more efficient.

The following information refers to COMMISSION REGULATION (EU) No 1016/2010 of 10 November 2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household dishwashers.

There are generic and specific ecodesign requirements given in the regulation. These requirements shall apply according to a timetable which is stated in the regulation.

3.4.1 Generic Ecodesign Requirements

For the calculation of the energy consumption and other parameters for household dishwashers, the cycle which cleans normally soiled tableware (hereafter standard cleaning cycle) shall be used. This cycle shall be clearly identifiable on the programme selection device of the household dishwasher or the household dishwasher display, if any, or both, and named 'standard programme' and shall be set as the default cycle for household dishwashers equipped with automatic programme selection or any function for automatically selecting a cleaning programme or maintaining the selection of a programme.

The booklet of instructions provided by the manufacturer shall provide:

- the standard cleaning cycle referred to as 'standard programme' and shall specify that it is suitable to clean normally soiled tableware and that it is the most ef-

ficient programme in terms of its combined energy and water consumption for that type of tableware;

- the power consumption of the off-mode and of the left-on mode;
- indicative information on the programme time, energy and water consumption for the main cleaning programmes.

3.4.2 Specific Ecodesign Requirements

Household dishwashers shall comply with the following requirements:

From 1 December 2011:

- for all household dishwashers, except household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the Energy Efficiency Index (EEI) shall be less than 71 (this corresponds to the energy class A);
- for household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the Energy Efficiency Index (EEI) shall be less than 80 (this corresponds to the energy class B) ;
- for all household dishwashers, the Cleaning Efficiency Index (I_c) shall be greater than 1,12.

From 1 December 2013:

- for household dishwashers with a rated capacity equal to or higher than 11 place settings and household dishwashers with a rated capacity of 10 place settings and a width higher than 45 cm, the Energy Efficiency Index (EEI) shall be less than 63 (this corresponds to the energy class A+) ;
- for household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the Energy Efficiency Index (EEI) shall be less than 71 (this corresponds to the energy class A) ;
- for household dishwashers with a rated capacity equal to or higher than 8 place settings, the Drying Efficiency Index (I_D) shall be greater than 1,08 (this corresponds to the drying efficiency class A) ;

- for household dishwashers with a rated capacity equal to or less than 7 place settings, the Drying Efficiency Index (I_D) shall be greater than 0,86 (this corresponds to the drying efficiency class B) .

From 1 December 2016:

- for household dishwashers with a rated capacity of 8 and 9 place settings and household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the Energy Efficiency Index (EEI) shall be less than 63.

The Energy Efficiency Index (EEI), the Cleaning Efficiency Index (I_C) and the Drying Efficiency Index (I_D) of household dishwashers are calculated in accordance with Annex II. EN L 293/34 Official Journal of the European Union

3.5 Comments on regulation and label

Most dishwashers on the market are built-in and 60 cm wide. From this type of dishwashers already a lot of appliances from well-known brands (Bosh, Siemens, Miele) achieve an energy efficiency class of A++ to A+++ according to the new label. However, only a few slimline dishwashers (45 cm wide) with the new label are already on the market.

At the moment not all brands offer already dishwashers according to the new label. In Austria we have not received product data from all manufacturers till now. It is supposed that when the producers change to the new label they will offer a lot of A++ or A+++ products. Therefore, it seems that the Commission's regulation and MEPS are rather soft and it is necessary to revise the EU energy label soon to facilitate further improvements. The top classes then should be held empty for future technical developments.

3.6 Requirements by The Blue Angel

The Blue Angel⁷ is a well-known environment-related label for products and services in the world. It sets voluntary minimum criteria for very energy-efficient and climate friendly products. The award criteria for dishwashers are described in RAL-UZ 152 and can be summarized as follows:

- Dishwashers must be energy efficiency class A, dishwashers with more than 9 place settings need an Energy Efficiency Index: < 63. The new labelling directive shall be applied upon its entry into force.
- Left-on mode: max. 2.0 Watt; Off mode: max. 0.5 Watt

⁷ For more information see <http://www.blauer-engel.de/en/index.php>

- The power consumption in “delay start mode” (user-programmed delay) shall be indicated
- Cleaning and drying efficiency: A (or according to the new labelling directive when it comes into force, a cleaning efficiency class is no longer required)
- Water consumption:
 - max. 9 litres/cycle for appliances with a rated capacity equal to or less than 9 place settings
 - max. 10 litres/cycle for appliances with a rated capacity equal to or higher than 10
 - max. 1.2 litres per place setting
- Noise Emissions:
 - 46 dB (A) for 45 cm wide appliances;
 - 44 dB (A) for 60 cm wide appliances.
- An AquaStop system is required

3.7 Ecolabel

The Ecolabel is part of a voluntary scheme, which commenced in 1992, and was revised in 2010. It sets out the basis according to which the Ecolabel can be awarded to products which have a reduced environmental impact (in other words, are more environmentally friendly).

The criteria requirements for each product type are not covered by Regulation 66/2010 itself but are set out in separate Commission Decisions. Decision 2011/81/EU published on 5 February 2011, prolongs the validity of the award of the Ecolabel to 6 different product groups.

3.7.1 Ecolabel for dishwashers⁸

The eco-labelling scheme for dishwashers was put in place for the first time in 1998 with Commission decision 98/483/EC, modified by Commission decision 2001/397/EC and

⁸ “Preparatory studies for Eco-design Requirements of EuPs – (Tender TREN/D1/40-2005) LOT 14: Domestic Washing Machines and Dishwashers, 2007”.

finally by Commission decision 2001/689/EC. The criteria were valid till August 2007. However, at the moment there are no valid criteria for the eco-label for dishwashers. The reason can be that only very few suppliers (manufacturers or importers) applied for the eco-label for dishwashers, probably due to the complexity and costs of the required criteria/awarding procedure compared to the lack of market value of the ecological label compared to the energy label.

3.7.2 Ecolabel on dishwasher detergents⁹

Decision 2003/31/EC for dishwasher detergents comprises all detergents intended for use exclusively in automatic domestic dishwashers and all detergents intended for use in automatic dishwashers operated by professional users but similar to automatic domestic dishwashers in terms of machine size and usage. The new ecolabel criteria for dishwashing detergents setting more stringent limits on certain chemicals and excluding phosphates.

The Ecolabel criteria aim in particular at promoting:

- the reduction of water pollution by reducing the quantity of detergent used and by limiting the quantity of harmful ingredients;
- the reduction of energy use by promoting low temperature detergents;
- the minimisation of waste production by reducing the amount of primary packaging.

3.8 Test Standards

3.8.1 IEC 60436 – Electric dishwashers for household use

The international test method for household dishwashers is the IEC60436 – Electric dishwashers for household use - Methods for measuring the performance.

Variants of this standard are used in Europe and Australia/New Zealand. The standard defines the following parameters for testing purposes:

- Definitions, rated capacity, dimensions, test conditions, water supply conditions
- Test loads, detergent, rinse aid, specialized equipment (reference dishwasher, oven, microwave oven, various kitchen utensils)
- Cleaning performance
- Drying performance
- Water and energy consumption, program time.

⁹ Source: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:111:0022:0033:EN:PDF>

Two types of load are permitted – these are an AHAM (US) style load and an IEC style load – the differences in loads are only minor. Manufacturer's instructions are followed except where they conflict with the requirements of the standard.

To assess washing performance, a range of standard soils (food) are prepared and added to specified load items. Soils added to load items include milk, tea, minced meat, egg, oat flakes, spinach and margarine. The soiled load is then dried (this can be in a specified oven for 2 hours at 80°C) or alternatively dried in air for not less than 15 hours prior to washing. The load is then washed and each load item is visually assessed by a judge under specified illumination conditions and given a score from 0 (dirty) to 5 (clean). The energy and water consumption and program time are determined using a soiled load.

For the drying test, a clean load is used. The load is washed and dried using the selected program. Each load item is visually assessed by a judge under specified illumination conditions and a score of 0 (wet), water drop (1) or 2 (dry) is awarded. Special provisions apply if the energy is greater during a drying test (no soil) when compared to a washing test (with soil).

A reference machine of defined performance is used to normalize the results for all test machines.

Tests are repeated 5 times on the same setting/program in order to get a valid result. Filters are not cleaned between runs. Up to 8 repeat tests are required if the specified variance limits are not met by 5 runs.

The standard defines dishwashers as automatic where no manual cleaning of filters is required between runs and manual where manual cleaning of filters is required. The IEC standard requires most load items to be directly supported by the basket, so this puts strict limits on the capacity claims that can be made. Only a whole number of place settings can be claimed. A loading plan for the IEC load must be supplied.

IEC60436 is a highly technical and complex testing standard and has undergone substantial technical development since the mid 1990's in an attempt to get a globally applicable test procedure. It requires a range of expensive testing equipment and the test materials and conditions for measurement are very tightly specified.

3.8.2 Regional differences in products and testing approaches

The best prospect for international harmonisation of dishwasher test procedures is to align with IEC60436. Variants of this test method are already used in Europe and Australia/New Zealand. The US was closely associated with the development of this standard, but it has not been adopted in North America as either a regulatory energy standard or as an industry standard (e.g. AHAM).

4 Economic and Market Analysis

The following information is based on the “Preparatory studies for Eco-design Requirements of EuPs – Lot 14: Domestic Washing Machines and dishwashers” of 2005 and the DEFRA study “Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe” in June 2009.

Automatic dishwashing machine penetration in the EU is reported to be very different from country to country, although detailed figures are not publicly available for all countries. The penetration levels are between 0 and 60%. In Western European countries there is an average market penetration around 40% and in Eastern European countries only of 3%. However, this penetration is increasing in all countries.

4.1 Sales and Stock data

This chapter presents some market data of dishwashers. The data given by the preparatory study are for the years 2002 and 2004 which are too old for a description of the current situation for which, in summary one can say that nearly all dishwashers are A-rated.

Table 6 shows the dishwasher sales by energy efficiency classes for the years 2002 and 2004. The A+ class results from a agreement between CECED manufacturers only (non-regulatory).

Table 6: Dishwasher sales for the years 2002-2004 (units)¹⁰

	TOTAL WEST		TOTAL EAST (CZ, HU, PL, SK)		TOTAL EAST
	January 2002 – December 2002	January 2004 – December 2004	January 2002 – December 2002	January 2004 – December 2004	January 2004 – December 2004
Grand Total	5.011.760	5.552.461	170.086	257.001	269.791
A++	0	0	0	0	0
A+	1.995	2.347	0	0	0
A	2.679.701	4.095.146	64.346	173.064	183.414
B	943.484	874.658	40.146	49.068	50.259
C	992.555	446.986	38.074	25.277	26.428
D	145.640	32.946	14.155	2.893	2.938
E	9.026	2.875	476	46	46
F	620	4	8	0	0
G	0	165	0	0	0
Unknown	238.738	97.333	12.828	6.538	6.635

¹⁰ Source: Preparatory Studies for Eco-design Requirements of EuPs – Lot 14 Domestic Washing Machines and Dishwashers, p. 129

Table 7 illustrates the stock, total stock energy consumption and unitary stock energy consumption of dishwashers in the EU 25 for the years 1995, 2000 and 2005. Around 37% of the households in the EU 25 own a dishwasher.

Table 7: Dishwashers EU 25: Stock, total stock energy consumption and unitary stock energy consumption for the years 1995, 2000, 2005¹¹

Year	Dishwashers Stock	Total stock Energy Consumption	Unitary stock Energy Consumption
	<i>thousand</i>	<i>GWh/year</i>	<i>kWh/year</i>
1995	46.741	17.828	381
2000	57.550	18.794	327
2005	68.608	18.557	270

More up to date data is given in the DEFRA study “Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe” in June 2009. The graphs below show the 2008 (10 months, from January to October) sales share for 9 countries and the number of models available by energy class. For the comparisons between countries, the numbers given are those of 2007.

A-class dishwashers have held a market share of 80% or more for many years. Therefore the “old” label does not assist with product differentiation anymore.

¹¹ Source: Preparatory Studies for Eco-design Requirements of EuPs – Lot 14 Domestic Washing Machines and Dishwashers, p. 156

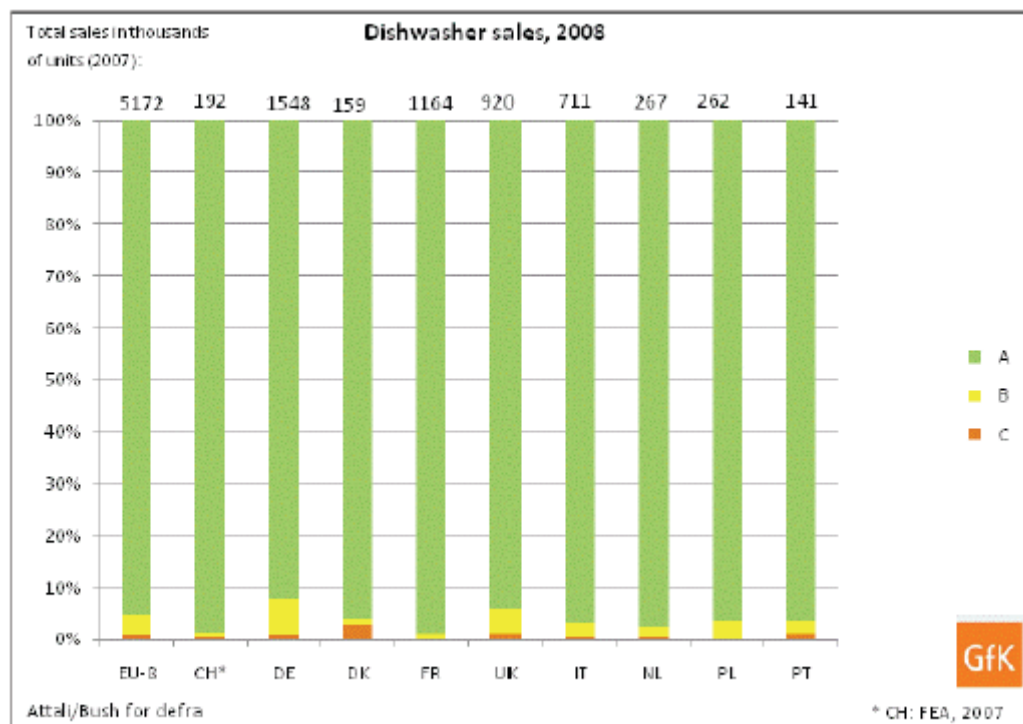


Figure 2 Dishwashers sales,2008¹²

In 2008 nearly all dishwashers were A-labelled and therefore no information about national differences was available.

¹² Source: DEFRA study "Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe", in June 2009, page 20.

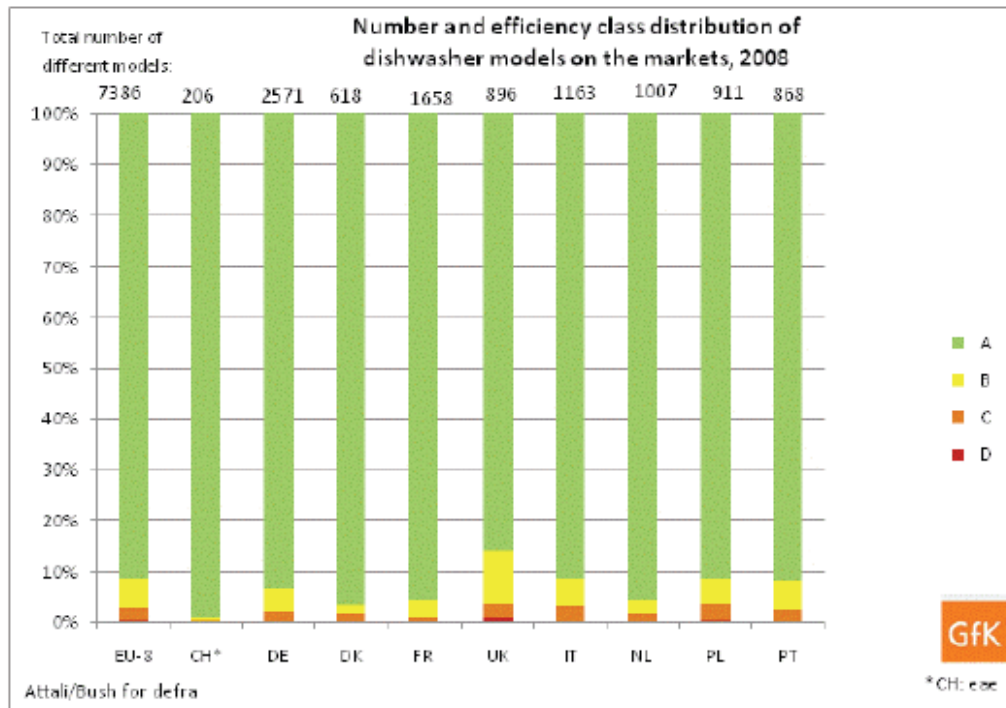


Figure 3 Efficiency class distribution, 2008¹³

Although the nine countries studied are governed by the same basic legislation on energy labelling and minimum energy performance standards, and are supplied by the same manufacturers, there are marked national differences in the market share of efficient models. This is caused mainly by brand policy (identical models with different names or vice versa), or by country (same models may have different reference names). Therefore information on the range or variety of products must be viewed with caution.

¹³ Source: DEFRA study "Factors influencing the penetration of energy efficient electrical appliances into national markets in Europe", in June 2009, page 21.

4.2 Manufacturers and Distributors

4.2.1 List of Manufacturers

Brand	Website
AEG	www.aeg.com
Beko	www.beko.co.uk
Bosch	www.bosch.com
GE	www.ge.com
Gorenje	www.gorenje.com
Haier	www.haiereurope.com
Hoover	www.hoover.co.uk
Hotpoint	www.hotpoint-ariston.com
Indesit	www.indesit.com/indesit
LG	www.lg.com
Kenmore	www.kenmore.com
Miele	www.miele.com
Siemens	www.siemens-home.com
Whirlpool	www.whirlpool.eu
Zanussi	www.zanussi.com

5 Selection Criteria

This chapter does not define specific target values to be met by Topten products in all Euro-Topten partner countries. According to the Topten concept, each country has to develop its specific Topten lists which depend on the products available on the national market. Thus, the specific thresholds for Topten lists depend on the products offered at national level and will be more or less stringent depending on the number of efficient products available. Currently www.topten.eu already lists built-in and freestanding full-size dishwashers.

The intention is rather to provide some recommendations regarding the criteria to be considered in Topten product listings and to give an idea of the efficiency of products currently offered on the market.

5.1 Product Sub-categories

We suggest the following product sub-categories

- Freestanding 60 cm wide
- Built-in 60 cm wide

In general it can be said that most dishwashers on the market are built-in (60 cm wide). So if there are a lot of very efficient built-in appliances, it is also possible to split the built-in dishwashers in

- Fully-integrated
- Semi-integrated

Currently we recommend to list full-size dishwashers (60 cm wide). At the moment there are not many slimline dishwashers with the new label on the market (45 cm wide). When more products are on the market it can be decided to list slimline dishwashers too. It is likely that for slimline dishwashers the criteria have to be adapted towards less efficiency.

5.2 Topten Selection Criteria

5.2.1 Technical criteria

The criteria for selection of the products shall be:

1. Energy efficiency class
2. Annual water consumption in litres / y
3. Drying performance class
4. Noise emissions

In countries where models with hot fills are common, a criteria could be added on the fact that the machine has a hot fill option

5.3 Recommendation for value setting

We suggest the following minimum values for a built-in (60 cm wide)

- class A+++
- annual water consumption max. 2800 litres / y
- drying performance: class A
- noise emissions: max. 46 dB(A)

We suggest the following minimum values for a freestanding (60 cm wide)

- class A++
- annual water consumption max. 2800 litres / y
- noise emissions: max. 46 dB(A)
- drying performance: class A

5.4 Topten product information

The following information can be shown on the Topten websites (in the tables) to ensure that the consumer gets sufficient information also on quality criteria other than energy efficiency. These information should not be used for the selection of the products and should be based on the new EU label which will be enter into force in December 2011.

Energy information:

- rated capacity, in standard place settings
- the energy efficiency class
- the annual energy consumption in kWh per year
- the annual water consumption in litres per year
- the drying efficiency class
- noise emissions in dB(A)
- programme time for the standard cleaning cycle in minutes
- the power consumption in off-mode and left-on mode
- costs after 15 years (energy & water)
- availability of a load sensor
- availability of hot water supply
- availability of water/flood protection

6 Additional Considerations

6.1 Health issues

To attract customers, the latest advance in dishwasher manufacture is the sanitation option with a high heat cycle to kill bacteria. The moist and hot environment serves as a perfect habitat for two types of dangerous fungi which can also be found in other kitchen appliances such as washing machines and coffee machines. Manufacturers therefore recommend to use the sanitation option or the programme with the highest temperature regularly (once a month).

6.2 Detergents

There are three different forms of detergents: tablets, powders and liquids. Sales trends indicate tablets are on the rise, currently holding 55% of market share, while granulates hold 43% and liquids a mere 2%.

It's not surprising tablets are the preferred choice as they're easy to use. However, this convenience comes at a price as they can cost much more per wash than powders. Tablets also need a longer cycle time to allow the detergent to fully dissolve, so you can not use fast wash and delicate cycles to save time, energy or water. On the other hand, powders are cheaper and further savings can be made if you dose correctly according to how dirty your dishes are, or if your machine is half-full.

Different kinds of dishwashing detergent contain different combinations of the items in the list below. Not all of the ingredients below are used in some detergents.

- Phosphates: Dissolves calcium and magnesium ions to prevent 'hard-water' type limescale deposits. They can cause ecological damage, so their use is starting to be phased out. Phosphate-free detergents are sold as eco-friendly detergents.
- Non-ionic surfactants: Lowers the surface tension of the water, emulsifies oil, lipid and fat food deposits, prevents droplet spotting on drying.
- Alkaline salts: These are a primary component, in older & original-style dishwasher detergent powders. Highly alkaline salts attack & dissolve grease, but are extremely corrosive (fatal) if swallowed.
- Enzymes: Breaks up and dissolves protein-based food deposits, and possibly oil, lipid and fat deposits. Proteases do this by breaking down the proteins into smaller peptides that are more easily washed away.

- Anti-corrosion agent(s): Often sodium silicate, this prevents corrosion of dishwasher components.

Dishwashing detergent may also contain:

- Anti-foaming agents: Foam interferes with the washing action.
- Additives to slow down the removal of glaze & patterns from glazed ceramics
- Perfumes
- Anti-caking agents (in powder detergent)
- Starches (in tablet based detergents)
- Gelling agents (in liquid/gel based detergents)
- Sand (inexpensive powdered detergents)

Besides older style detergents for dishwashers, biodegradable detergents also exist for dishwashers.

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www.topten.eu – Best Products of Europe

www.topten.info – International Platform for Best Products