Topten ACT Criteria Paper

Dishwashers

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Topten ACT aims at transforming the European market of energy-using products towards higher energy efficiency.
Topten ACT identifies the top energy-efficient products in 16 European countries, and makes this information available to consumers and large buyers on tailored national websites. The most energy efficient models in different product categories (such as household appliances, lighting, office equipment, consumer electronics, cars) are presented with comprehensive product information based on official labels and standardized declarations. Topten works with manufacturers and thus increases both market offer and consumer demand of high energy efficiency products. Topten is strictly neutral and independent from manufacturers and retailers, its selection criteria are always published online.
Topten ACT is supported by the European Commission's research and innovation programme Horizon 2020, and many national organisations (energy agencies, environmental and consumer organisations, research institutes). The Topten ACT project involves 17 partners in 16 European countries. It is coordinated by ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie).
More information and access to all national websites on the European site: www.topten.eu

WP2 European Product Analysis , Task 2.1 Determining energy efficiency criteria, D 2.1 Periodic Criteria Papers (first set)

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1. Topten.eu: Dishwashers - current selection criteria and products selected

Topten.eu selection criteria since:

- Built-in: energy efficiency class A+++
- Freestanding: energy efficiency class A++
- All: Drying efficiency class A
- Max. water consumption: 2800 litres / year
- Hot fill has to be possible
- Water / flood protection

Numbers of dishwasher models currently on Topten.eu according to energy/drying efficiency (last update: June 2014):

	Built-in	**Freestanding**	Total
A+++/A	15	2	17
A++/A	-	5	5
Total	15	7	**22**

Similar models have not been counted if from the same brand.

There are 22 dishwasher models of 8 different brands on the Topten.eu product list: Bauknecht, Blomberg, Bosch, Gaggenau, Miele, Siemens, V-ZUG, Zanussi. The built-in models have 13 (8) or 14 (7) place settings, the freestanding ones 10 (1), 12 (2), 13 (2) or 14 (2) place settings. The freestanding A+++ models have 13 and 14 place settings.

2. Expected selection criteria in 2016

In 2016 the Totpen.eu selection criteria will presumably be A+++/A for all models (and the water consumption, hot fill and flood protection criteria will be kept).

3. Technical background

The cleaning process is based on the four factors known as the Sinner circle: mechanics, temperature, chemistry and time. These factors can, to a certain degree, be exchanged by each other. In hand dishwashing, mechanics is the most important factor. In an electric dishwasher, mechanics is exchanged by temperature, chemistry and time. Heating up the water is the most energy-consuming process in a dishwasher. Despite this, washing by hand consumes in most cases more energy – mostly because a larger amount of hot water is used.
Typical phases of a dishwashing cycle:

1. Pre-rinse, cold or warm water
2. Main cleaning phase, warm to hot water (40° - 70°C)
3. Intermediate rinse, tepid water
4. Hot rinse, with rinsing agent
5. Drying.

Usually there are two heating phases: for the main cleaning phase and the hot rinse. Normally the water is heated by electric resistance. Heat exchangers can reduce the heat loss, while a heat pump (HP) can improve the efficiency of the heating process (the first HP dishwasher, a built-in V-ZUG model improves the efficiency by 40% compared to the A+++

threshold!). The Zeolith technology recovers the condensation energy of the steam. Another option for energy saving is reduced water consumption – however the rinsing effect already seems to reach its limits now, and it is doubtful whether further water reduction is possible without serious performance loss. This is why a minimum rinsing performance is suggested by some stakeholders. (All technical info from: JRC, 2015)

Most dishwashers can be connected directly to hot instead of cold water. The so-called 'hot fill' can save electrical energy if the household's hot water is heated with renewables (e.g. solar energy or wood) or efficiently with a heat pump – then the dishwasher does not need any additional energy for heating up the water electrically.

4. Policy measures, standards and labels

The Ecodesign and Energy Label regulations for Dishwashers are currently being revised. The Joint Research Center (JRC) will publish a preparatory study around end of 2015, suggesting thresholds for a revised Energy Label and Ecodesign requirements. Expected savings of the current regulations are 3.5 TWh in 2025. The revision holds a potential of another 1.4 TWh savings in 2030, according to a Commission note.
The German Ecoabel 'Blauer Engel' has also established criteria for dishwashers (A++ and A+++ for energy efficiency), but to date there are no products.

Ecodesign requirements

The Ecodesign regulation No 1016/2010 for household dishwashers was adopted in 2010 and specifies requirements that are strengthened in three stages up to 2016.

Table 1: Energy efficiency requirements tier 1 to 3:

Class	EEI	Tier 1 (Dec 2011)	Tier 2 (Dec 2013)	Tier 3 (Dec 2016)
A+++	EEI < 50			
A++	50 ≤ EEI < 56			
A+	56 ≤ EEI < 63		≥ 11 ps 10 ps + width > 45cm	8 + 9ps 10 ps + width ≤ 45 cm
A	63 ≤ EEI < 71	All other DWs	10 ps + width ≤ 45 cm	
B	71 ≤ EEI < 80	10 ps + width ≤ 45 cm		

Energy efficiency requirements depend on the number of place settings (ps) and, for dishwashers with 10 ps, also on the width (above or below 45cm). Since December 2013 dishwashers must either comply to class A (small DWs) or class A+ (larger DWs). After December 2016 all dishwashers must be at least in class A+, except those with 7 or less place settings, which must be at least in class A since December 2011.
Additionally there are 'drying efficiency' requirements since December 2013 for DWs with 8 and more ps (ID >1.08 / class A) and DWs with 7 and less ps, respectively (ID > 0.86 / class B).
Since December 2011 the cleaning efficiency of all dishwashers must be greater than 1.12 – corresponding to the old class A (Label from 1997).

Energy Label

In 2010 the current Energy Label (Labelling regulation No 1059/2010) was introduced, adding the classes up to A+++. The Energy Efficiency Index (EEI) calculation is based on annual energy consumption for 280 standard cycles, including low power modes (left-on and off mode).

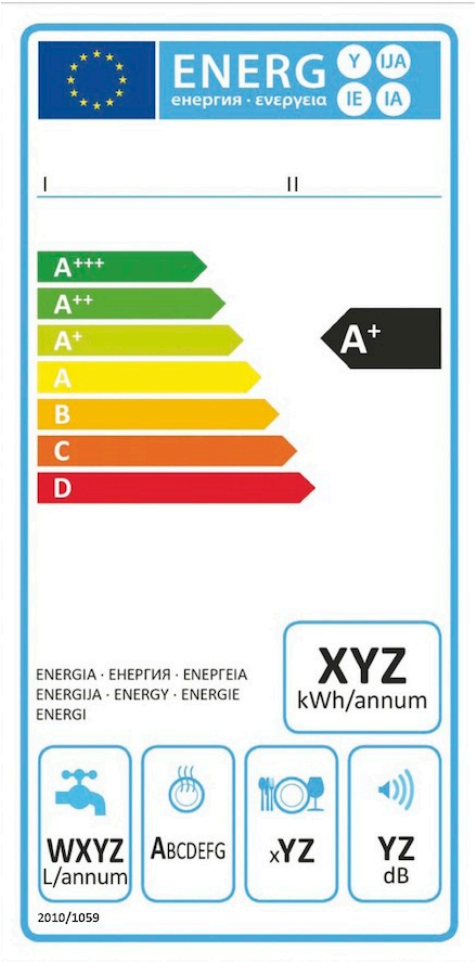


Table 2: Classification scale of the current Energy Label

Energy Efficiency Class	Energy Efficiency Index (EEI)
A+++	EEI < 50
A++	50 ≤ EEI < 56
A+	56 ≤ EEI < 63
A	63 ≤ EEI < 71
B	Phased out since Dec 2013
C	
D	

Classes below A are still shown on the Label, even though they are prohibited on the market. The Energy Label also shows the annual energy and water consumption, drying performance, number of place settings and the sound power level. In the Label fiche, additionally the energy consumption of the standard cycle, programme time of the standard cleaning cycle, power in off- and left-on modes, and duration of the left-on mode are declared.

The Label and Ecodesign requirements refer to the ECO program, and this is the one that is tested –the most efficient program. A problematic aspect is that users might not consider the Eco program as appropriate for everyday use, and some think that it takes too long. If users switch to other programs, nothing is known about the real energy consumption.

Measurement standard

Dishwashers are tested according to the European standard EN 50242/ EN 60436 'Electric dishwashers for household use – methods for measuring the performance'. The double numbering is used because the old dishwasher labelling directive made direct reference to EN 50242, while according to CENELEC rules the number of the IEC standard must be used, if the EN standard is harmonised.

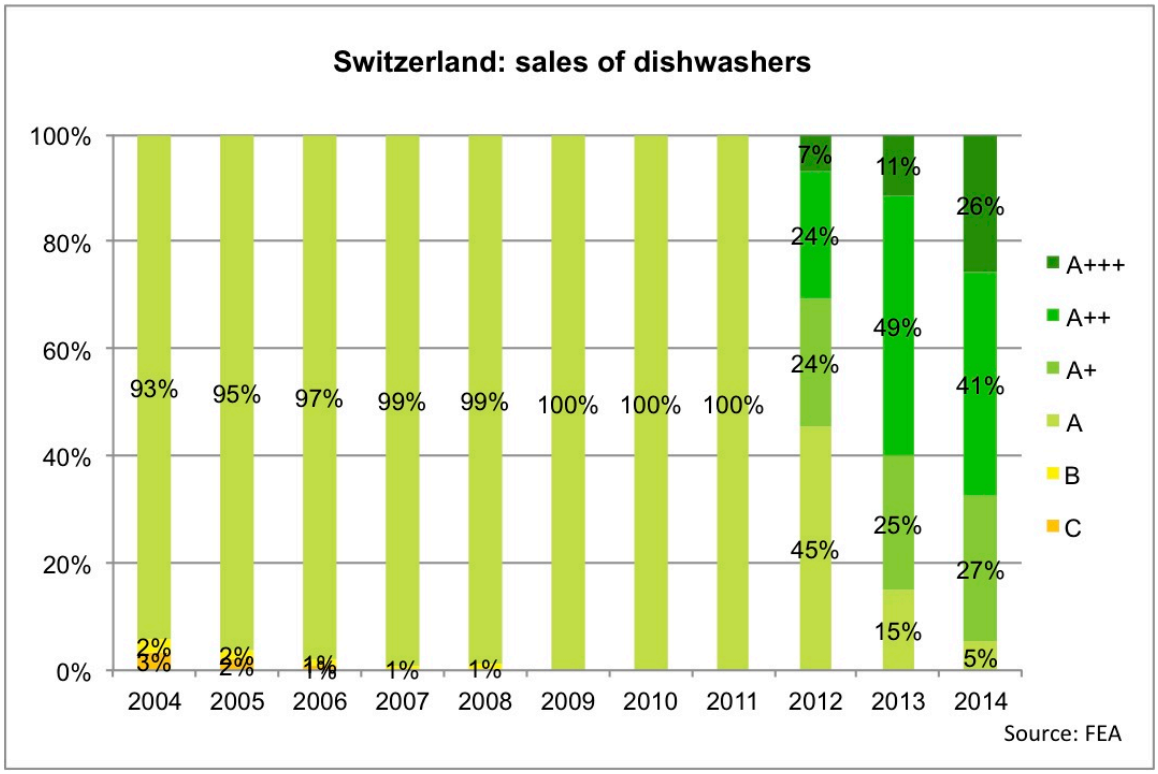
A new (international) IEC standard has been elaborated (IEC 60436 Ed. 4), which includes a different standard load that reflects better consumer use. It also includes plastic items, coffee mugs, stainless pots and glass bowls, adding different materials and shapes to the test load. CENELEC will adopt the new international test load also for the future EN edition.

5. Market analysis

EU-27 sales in 2010 have been estimated at around 7 million units, with a stock of around 83 million units. By 2020 sales and stock are expected to increase to 9-10 million units per year / > 115 million installed units (JRC, 2015). There seem to be considerable differences between Member States: while the market is nearly saturated in Northern and Central Europe, Mediterranean countries are around 50% and are expected to show higher growth

rates once the economic situation has improved. In Eastern Europe market penetration is yet as low as around 10% (JRC, 2015).

More detailed sales data from Switzerland is available from 2004 to 2014. It shows that the old Label from 1997 was already outdated in 2004, with > 90% of the sales being in the top class A. It took another eight years until the current label with classes up to A+++ was applied. During this time, efficiency improvements nearly stopped completely, as there was no incentive to do so. In 2014, 25% of the Swiss sales were in the top class A+++.



6. FAQ

The Eco program takes longer than the normal program. Does this mean that it uses more energy?

No! The ECO program can reduce the energy consumption because it takes longer – it can wash at a lower temperature but dishes will still be clean. It is also important to know that the ECO program is the one that is tested – for energy consumption but also for cleaning performance. Using this program, users can be sure to have a low energy consumption (declaration on the energy label) and clean dishes (minimum requirement) at the same time. The other programs are not tested – accordingly there are no cleaning performance requirements for these, and the energy consumption is not declared and not known (or if a value is in the manual, it is only indicative, because it does not need to be according to the official standard and will never be verified by market surveillance because manufactures are not oblige to declare this).
Therefore the ECO program is the one to be used whenever possible.

7. References and links

Useful links

Topten.eu dishwashers product lists:
http://www.topten.eu/english/household/dishwasherss/built-in-2.html
http://www.topten.eu/english/household/dishwasherss/freestanding-2.html

Topten.eu dishwashers selection criteria:
http://www.topten.eu/english/criteria/dishwashers.html&fromid=

References

Ecodesign requirements dishwashers: Commission regulation (EU) No 1016/2010:
http://www.topten.eu/uploads/File/Ecodesign%20REG_1016_2010_dish.pdf

Energy Labelling regulation No 1059/2010 for dishwashers:
http://www.topten.eu/uploads/File/1059-2010_Energy_label_dishwasher.pdf

Amendment regarding Online Energy Labels - Regulation No. 518/2014:
http://www.topten.eu/uploads/File/Online-Energy-Labels-518:2014-EN.pdf

Topten policy recommendations, March 2015:
http://www.topten.eu/english/recommendations/policy-recommendations-for-dishwashers.html&fromid=

Information about the EU ecodesign process on washing machines and other products:
http://www.coolproducts.eu/

Blauer Engel, award criteria for dishwashers:
https://www.blauer-engel.de/en/products/electric-devices/household-dishwashers

JRC, Draft preparatory study on dishwashers, June 2015. Not yet published.