

Topten ACT Criteria Paper

Storage refrigeration

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Eva Geilinger

Bush Energie GmbH

eva.geilinger@bush-energie.ch



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.

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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: storage refrigeration - current selection criteria and products selected

Topten.eu selection criteria (September 2015):

- Refrigerant with global warming potential (GWP) below 150 (e.g. R290/propane, R600a/isobutane, R744/CO₂)
- Energy efficiency index (EEI) not higher than given in the following table (calculated according to EU regulation 2015/1094 - energy labelling of professional refrigerated storage cabinets):

Category	Energy efficiency index	Energy efficiency class
Storage counter refrigerators	<35	B
Storage refrigerators 1-door	<50	C
Storage refrigerators 2-doors	<75	D
Storage counter freezers	<35	B
Storage freezers 1-door	<75	D
Storage freezers 2-doors	<75	D
Storage refrigerator-freezers	<75	D

Numbers of storage refrigerators currently on Topten.eu according to energy efficiency class (September 2015):

Category	A	B	C	D	Total
Storage counter refrigerators	3	1	-	-	4
Storage refrigerators 1-door	6	4	14	-	24
Storage refrigerators 2-doors	-	-	4	4	8
Storage counter freezers	1	1	-	-	2
Storage freezers 1-door	1	3	2	14	20
Storage freezers 2-doors	-	-	-	5	5
Storage refrigerator-freezers	-	-	-	1	1
Total	11	9	20	24	64

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

There are 64 models of 7 different brands on the Topten.eu product list:
Gram, Desmon, Electrolux, Foster, Liebherr, Porkka, Snowflake

2. Expected selection criteria in 2016

Topten.eu selection criteria expected for 2016:

From 1 July 2016 the EU energy label will be mandatory and all products on the market can then be evaluated by Topten. It is difficult to make a forecast if the criteria will have to be tightened then. The brands most known for energy efficient products are largely already present in the Topten lists. We expect to create product lists for light-duty and heavy-duty storage cabinets then (no forecast for the criteria can be made, the categories will be the same seven as for "normal" storage cabinets). We also expect to create product lists for

plug-in blast cabinets that are covered by the same regulation as storage cabinets. They are excluded from labelling and Ecodesign, but declaration of energy consumption (kWh/kg), full load capacity in kg, standard temperature cycle and refrigerant will be mandatory from 1 July 2016. The same is the case for combined storage refrigerator-freezers (also called multi-temperature cabinets): no label or Ecodesign, but mandatory information on energy consumption from 1 July 2016 (they are already listed on Topten and will continuously be).

3. Technical background

Professional refrigerated storage cabinets are intended for use in professional kitchens: they meet high requirements regarding food hygiene and function well in high ambient temperatures of 30°C. They are tested at climate class 4 (30°C, 55% relative humidity).

There are two additional categories of storage cabinets called “light-duty” and “heavy-duty”. Light-duty cabinets are not suited for use in hot professional kitchens and are tested at climate class 3 (25°C, 60% relative humidity). For labelling, their measured energy consumption is multiplied by a factor of 1.2 (chilled) or 1.1 (frozen).

Heavy-duty cabinets are suited for use in up to 40°C ambient temperatures and are tested at climate class 5 (40°C, 40% relative humidity).

Typical features are forced-air circulation, temperature monitoring and display, stainless steel surfaces, high cooling capacity. They typically look like this:



Products with green refrigerants (R600a and R290) are currently available for all cabinet types in all sizes, even though HFCs (hydrofluorocarbons) like R134a and R404A are still the most commonly used refrigerants. The latter have very high global warming potentials (GWP). With the revised F-gas regulation of 2014, the EU decided to phase out these climate-damaging refrigerants in commercial refrigerators and freezers by 2020 / 2022 (Table 1).

10. Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more		1 January 2015
11. Refrigerators and freezers for commercial use (hermetically sealed equipment)	that contain HFCs with GWP of 2 500 or more	1 January 2020
	that contain HFCs with GWP of 150 or more	1 January 2022

Table 1: Prohibitions for placing on the market in the f-gas regulation (excerpt)

A third category, blast cabinets are intended to rapidly cool hot foodstuffs to below 10 °C in the case of chilling and below –18 °C in the case of freezing. They typically look like this:



4. Policy measures, standards and labels

The EU energy label and Ecodesign requirements will be mandatory from 1 July 2016. The labelling regulation covers only professional refrigerated storage cabinets. The Ecodesign regulation covers them and also blast cabinets, condensing units and process chillers. Professional refrigerated storage cabinets (normal, light-duty and heavy-duty) do not include cabinets that are static-air, remote, built-in, roll-in, pass-through or chest freezers. Blast cabinets include both remote and plug-in. Condensing units and process chillers are system components and therefore not typical Topten products.

Annual energy consumption in the EU related to condensing units, process chillers and professional refrigerated storage cabinets was estimated at 116.5 TWh (terawatt hours) in 2012. Without the two regulations, annual energy consumption could have been expected at 134.5 TWh in 2020 and 154.5 TWh in 2030. The combined effect of the two regulations is expected to result in annual savings of 6.3 TWh by 2020 and 15.6 TWh by 2030, as compared with what would happen if no measures were taken (source: Ecodesign regulation). This means that total energy consumption for professional refrigeration is expected to still increase in the future (because of growing markets) even with the new EU policies. The measures' effect is not strong enough to stabilise or turn around the trend to increasing total energy consumption.

There are no other Ecolabels for professional refrigerated storage cabinets and blast cabinets. Manufacturers often highlight technical features linked to energy efficiency or environmental friendliness such as "LED lighting", "green refrigerant", "variable-speed compressor", "energy management system", "efficient fan blades" etc.

Energy label

The EU energy label is defined in EU regulation No 2015/1094. It will be mandatory from 1 July 2016. From 1 July 2019, the energy classes will go up to A+++. Manufacturers are free to use the A+++ label earlier if they have models better than A. The label shows the following quality aspects:

- Energy efficiency class: the classification is based on annual energy consumption and net volume
- Annual energy consumption (kWh/year)
- Net volumes of compartments functioning at chilled and frozen operating temperature (L)
- The climate class (3, 4 or 5), together with the associated dry bulb temperature (°C) and the relative humidity (%)

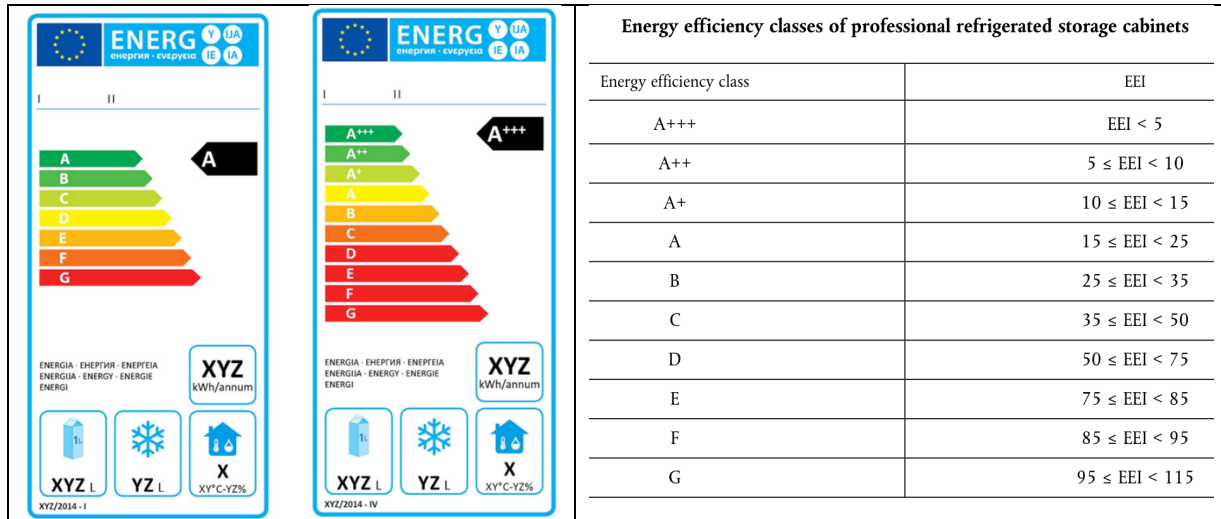


Figure 1: EU energy label for professional refrigerated storage cabinets

Ecodesign requirements

The Ecodesign requirements are defined in EU regulation No 2015/1095. For professional refrigerated storage cabinets they are:

1 July 2106: $EEI < 115$

1 January 2018: $EEI < 95$

1 July 2019: $EEI < 85$

For combined refrigerator-freezers and blast cabinets there is only the obligation to declare energy consumption from 1 July 2016, but no minimum energy efficiency requirements, and no specific energy label.

Measurement standard

Product information and declarations on the energy label are based on measurements according to prEN 16825 (professional refrigerated storage cabinets).

4.1. Market analysis

There are 12 times more household refrigerators and freezers (304 million units) in the EU than there are plug-in commercial and professional refrigerated cabinets (25 million units). Nonetheless the commercial and professional cabinets use nearly as much energy (43 TWh/year) as the household refrigerators and freezers (84 TWh/year). Size and cooling capacity notwithstanding, the main reason commercial and professional cabinets use much more energy is that they are not energy efficient. Household refrigerating appliances have improved tremendously over the past 20 years thanks to the EU energy label and ecodesign requirements. Energy consumption was reduced by more than 70% (currently required class A+ compared to class G). Similar improvements can be expected for commercial/ professional products. Product comparison shows that:

- Typical products with doors use twice as much energy as best models
- Open products use 6 times more energy than best models with doors

The biggest barrier for both manufacturers and buyers of commercial/ professional refrigerated cabinets is that no standardised product information is available to compare the energy costs of different models. Energy consumption values are currently only found sporadically in catalogues and not suited for comparison because testing conditions are unknown. Figure 2 shows standardised energy consumption values compared to catalogue data for the same models. It becomes clear that energy consumption values declared in catalogues are typically lower than standardised energy consumption. Manufacturers have

little incentive to declare standardised data because the values would be considerably higher.

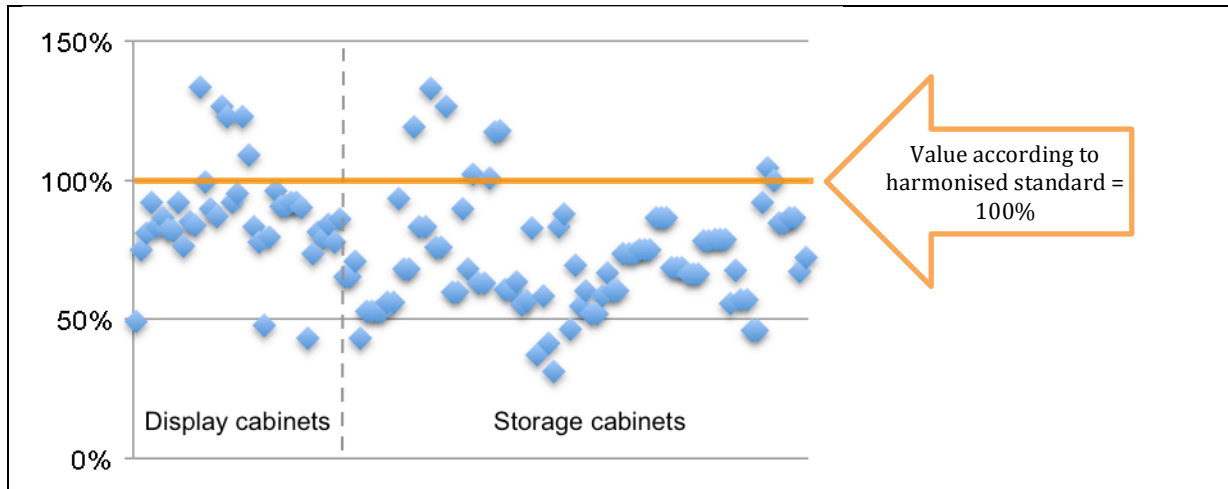


Figure 2: Energy consumption values found in catalogues in relation to data according to harmonised standards

5. References and links

Useful links

Topten.eu storage refrigeration product lists:

- <http://www.topten.eu/english/professional-refrigerators/storage-refrigerators/storage-counter-refrigerators.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-refrigerators/storage-refrigerators-1-door.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-refrigerators/storage-refrigerators-2-doors.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-freezers/storage-counter-freezers.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-freezers/storage-freezers-1-door.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-freezers/storage-freezers-2-doors.html>
- <http://www.topten.eu/english/professional-refrigerators/storage-combined-refrigerator-freezers.html>

Topten.eu storage refrigeration selection criteria:

- <http://www.topten.eu/english/criteria/professional-storage-refrigerators.html&fromid=>

Publications:

- Commercial and Professional Refrigeration Products: Promoting Energy Efficiency with Legislation, Empowered Stakeholders and Rebates. Eva Geilinger, Eric Bush. EEDAL 2015. Presentation: http://www.topten.eu/uploads/File/EEDAL15_Eva_Geilinger_Presentation_Commercial_and_Professional_Refrigeration_Products.pdf

Paper:

http://www.topten.eu/uploads/File/EEDAL15_Eva_Geilinger_Commercial_and_Profesional_Refrigeration_Products.pdf

References

- Commission delegated regulation (EU) 2015/1094 of 5 May 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of professional refrigerated storage cabinets:
http://www.topten.eu/uploads/File/2015-1094_EN_Professional-equipment_Label.pdf
- Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers:
http://www.topten.eu/uploads/File/2015-1095_EN_Professional-equipment_Ecodesign.pdf
- Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006