



# ProCold Product Competition

## *Professional and Commercial Refrigeration Equipment*

### – Competition results –

With support from the European Union's Horizon 2020 research and innovation programme the ProCold project and its partners

ADEME – Agence De l'Environnement et de la Maîtrise de l'Energie (France), AEA – Austrian Energy Agency (Austria), Bush Energie (Switzerland), Guide Topten (France), Oeko-Institut – Institute for Applied Ecology (Germany), Politecnico Milano – Dipartimento di Energia (Italy), Quercus – National Association for Nature Conservation (Portugal), SEVEn (Czech Republic), and SSNC – Swedish Society for Nature Conservation (Sweden)

have invited manufacturers of professional cold equipment to take part in a product competition for the most energy efficient products with climate friendly refrigerants available in the European market in the following categories:

#### **Vertical chilled storage cabinets**

#### **Beverage coolers**

#### **Small ice cream freezers**

#### **Vertical supermarket refrigerator cabinets**

#### **Refrigerated glass fronted vending machines**

The competition had as main objectives to

- **identify** the professional and commercial cold products with the highest energy efficiency (and climate friendly refrigerant use),
- **highlight** and **increase visibility** of such products among professional buyers and other stakeholders,
- **promote** their further market uptake, and
- **motivate** the development and offer of increasingly efficient energy-using products in the European market.



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## Eligible products and test conditions

Plug-in refrigeration appliances in the following five categories were eligible to the competition and tested for energy consumption and energy efficiency according to specified test norms and calculation procedures:

### i. Vertical chilled storage cabinets

- As defined in Ecodesign Regulation (EU) 2015/1095 of 5 May 2015
- 1-door, 400-700 litres net volume calculated according to EN 16825:2016 (approved)
- Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO<sub>2</sub>)
- Temperature class M1 according to EN 16825:2016 (approved) (-1°C to +5°C)
- Energy efficiency index (EEI) determined at 30°C/55% RH based on measurements according to EN 16825:2016 (approved) and EEI calculation according to Ecodesign Regulation (EU) 2015/1095

### ii. Beverage coolers

- As defined in the (draft) European Ecodesign Regulation for refrigerated commercial display cabinets available on 31 August 2016 (and provided on [topten.eu/pro-cold](http://topten.eu/pro-cold))
- 250 – 550 litres net volume calculated according to FprEN 16902 (under approval), vertical cabinet with one transparent door
- Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO<sub>2</sub>)
- Temperature class K1 according to FprEN 16902 (under approval) (0°C to +7°C,  $\varnothing \leq +3.5^\circ\text{C}$ )
- Energy efficiency index (EEI) determined at 25°C/60% RH based on measurements according to FprEN 16902 (under approval) and EEI calculation according to applicable (draft) European Ecodesign Regulation

### iii. Small ice cream freezers

- As defined in the (draft) European Ecodesign Regulation for refrigerated commercial display cabinets available on 31 August 2016 (and provided on [topten.eu/pro-cold](http://topten.eu/pro-cold))
- 150 – 500 litres net volume calculated according to FprEN 16901 (under approval), with transparent lids
- Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO<sub>2</sub>)
- Temperature class C1 according to FprEN 16901 (under approval) (-18°C)
- Energy efficiency index (EEI) determined at 30°C/55% RH based on measurements according to FprEN 16901 (under approval) and EEI calculation according to applicable (draft) European Ecodesign Regulation

### iv. Vertical supermarket refrigerator cabinets

- As defined in the (draft) European Ecodesign Regulation for refrigerated commercial display cabinets available on 31 August 2016 (and provided on [topten.eu/pro-cold](http://topten.eu/pro-cold))
- Total display area (TDA) between 0.5 and 3 m<sup>2</sup> calculated according to EN ISO 23953-2:2015
- Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO<sub>2</sub>)

- Temperature class M1 (-1°C to + 5°C) according to EN ISO 23953:2015
- Energy efficiency index (EEI) determined at 25°C/60% RH based on measurements according to EN ISO 23953-2:2015 and EEI calculation according to applicable (draft) European Ecodesign Regulation

**v. Refrigerated glass fronted vending machines**

- As defined in the (draft) European Ecodesign Regulation for refrigerated commercial display cabinets available on 31 August 2016 (and provided on [topten.eu/pro-cold](http://topten.eu/pro-cold))
- Category 2 “Refrigerated glass fronted can and bottle, confectionery & snack machines” according to EN 50597:2015
- Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO<sub>2</sub>)
- Temperature class according to Category 2 machine type (12°C)
- Energy efficiency index (EEI) determined at 25°C/60%\* RH based on measurements according to EN 50597:2015 and EEI calculation according to applicable (draft) European Ecodesign Regulation
- \* EN 50597:2015 will be revised soon to better align with other standards and to be in alignment with the Ecodesign requirements. One planned change is with regard to the ambient test room conditions. In the upcoming revision of the norm these are expected to be fixed at 25 ± 2°C/60 ± 5% RH. These expected conditions were applied for measurements for the product competition.

**Independent testing of energy consumption**

Products in each product category were assessed according to the defined measurement standards and test conditions. The Energy Efficiency Index (EEI) was the core performance criterion based on which the winner in each category was determined. EEI calculation and test conditions were as much as possible based on existing (in the case of professional storage cabinets) or expected (in the case of commercial refrigeration cabinets) energy label regulations.

Based on submission info and reported energy performance, the most efficient appliance in each category was selected for independent testing. Independent tests were performed by two internationally recognised laboratories: Re/genT in the Netherlands and DTI in Denmark.

In categories in which two appliances had similar reported energy performance two independent tests were performed (this was the case in the vertical chilled storage cabinet category). As one of the tested cabinets did not meet reported performance, this approach proved helpful for timely winner identification. In cases, in which testing repeatedly failed (one case in the vertical supermarket refrigerator category), the appliance with second best performance was additionally tested.

In two categories (beverage coolers and ice cream freezers) an additional appliance each was tested, which were not officially submitted to the competition but for which the ProCold consortium expected high efficiency. These were not officially part of the competition (as they were not formally submitted) but were tested to gain a better understanding of market development and top performing products in these categories.

A winner was selected in each category based on confirmed energy performance and winners awarded at the international EuroShop fair on 7 March 2017 in Düsseldorf, Germany.

## Winning products

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### *Category 'Vertical storage cabinets'*

The winning model of this category is the Gram Superior Plus K 72 G. With an energy consumption of 285 kWh/year and a volume of 462 litres, this refrigerator reaches an energy efficiency index of 20,8. Compared to an inefficient product with an Energy Efficiency class of G, this class A refrigerator uses 4-5 times less energy.

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### *Category 'Beverage coolers'*

The winning model of this category is the Liebherr FKDPv 4503. This beverage cooler consumes a yearly amount of 449 kWh, which is significantly less than the energy consumption of an inefficient beverage cooler, with around 2,600 kWh/year.

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### *Category 'Small ice cream freezers'*

The winning model of this category is the Liebherr GTEP 3302. The product consumes 589 kWh per year. In comparison, an inefficient ice cream freezer consumes four times as much energy per year.

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### *Category 'Vertical supermarket refrigerator cabinets'*

The winning model of this category is the Carrier Optimer 0948LG R290. The Carrier Optimer 0948LG R290 consumes 3.030 kWh per year which is 10.000 kWh less than an inefficient model.

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### *Category 'Refrigerated glass fronted vending machines'*

The winning model of this category is the Sielaff GF Robimat XM. This glass-fronted vending machine shows a measured yearly energy consumption of 1.628 kWh. It is among the first vending machines on the market that uses CO<sub>2</sub> as refrigerant.

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## Cross-cutting competition results and observations

Winning products across product categories demonstrate that **energy efficient products with eco-friendly refrigerants are available today**, providing significant energy and cost savings to users. Results in all test categories confirmed or exceeded highest known energy performance (as listed on the Topten portals).

In the storage cabinet category (for which energy label and eco-design regulations are in place) one competition entry had to be disqualified as it **did not meet displayed energy performance**. It is unclear if this is just an exception or representative of a more widespread phenomenon and raises the question **if and how market surveillance should be intensified to identify deviations from labelled values**. However, the low number of tests in the competition do not merit a definitive answer to this question.

Net volume and total display areas (TDA) of cabinets have a substantial influence on EEI calculations and results. However, interpretation of test standards may not be unambiguous. In particular, in the supermarket refrigerator cabinet category manufacturers treated glass windows on the side of the cabinet differently. Including or not including side windows vastly influences total display area and hence EEI (in one case this changed EEI from 34 to 46). The ProCold consortium had to take a decision, after consulting with experts, on which basis EEI should be compared and did not take side windows into account. Net volume calculations also deviated in other categories, albeit within tolerance margins. Future revisions of **test standards should ensure that net volume and TDA calculations are unambiguously defined**. Also, rating plates of display cabinets, e.g. for beverage coolers, showed net volumes much higher than according to latest test norms. However, manufacturers are not required to display volume according to specific test norms as no regulation is yet in place.

The competition exemplified the **value of independent testing of energy performance**. Two of the tested cabinets were either not meeting performance requirements or had significantly higher EEI compared to reported energy performance. Possibly only such independent testing can reveal such cases.

Setting up of cabinets for testing can take time, in particular when cabinets are very sensitive to changing environmental conditions. As this preparation time is presumably not available when cabinets are set up in practice for actual use, there is a **risk that they only achieve nominal performance in artificial test settings**. Test standards could require cabinets to maintain performance in changing environmental conditions and/or define the maximum number of changes of controls required until expected performance is achieved.

For one appliance a slightly modified software had to be used for testing to limit movement of parts within the appliance to allow for placement of temperature sensors. **Software will likely play a more important role in future generations of refrigeration cabinets**, providing a range of specific functions. This raises questions with regard to the “default” settings that must be used for testing. Test norms and Ecodesign regulation should take this into account.

## More information

For more information on the ProCold project, please visit

[topten.eu/pro-cold](http://topten.eu/pro-cold)