tested by RE GENT

DC Rotary Technology

2x3D

CAREL

Heez for beverage coolers

Efficiency and performance tested by Re/genT

Re/genT is a laboratory specialising in testing and R&D for the refrigeration and air-conditioning sectors, with the focus on green innovations, energy efficiency and alternative refrigerants.

CAREL tested its Heez solution at the Re/genT laboratories in accordance with European standard EN16902 and DOE 2017 in the USA.

Connected Efficiency

What
- Glass door cooler equipped with Heez solution
- Results tested at an external laboratory: Re/gent
- Efficiency and performance tests in accordance with European standard EN16902 and US DOE 2017

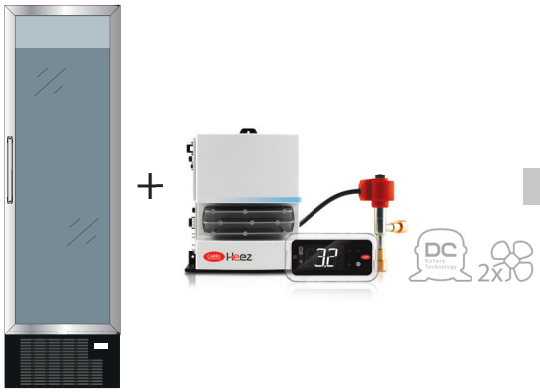
Why
- To highlight the results achievable with the Heez solution implemented on a beverage cooler available on the market.

The results obtained show a 47%(*) reduction in power consumption compared to the best-in-class solutions in accordance with the European test protocol, and a 52% reduction compared to the limits set in DOE 2017.

CAREL selected a beverage cooler available on the market with standard features, and after having replaced the main components with those provided by the Heez solution, tested the cooler at the Re/genT laboratories in the Netherlands.

The main components installed were:
- Rotary DC inverter compressor
- CAREL EEV electronic expansion valve
- Modulating fans with DC technology

The efficiency and performance tests required by the relevant standards were conducted:
- EN16902, energy consumption and Half Reload Recovery
- DOE 2017, energy consumption and door opening test.



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Description of the beverage cooler

- Glass door cooler
- Gross volume 397 l
- Wall thickness 42 mm
- No. cans/capacity: 497/33cc
- Interior LED lights - 12W
- HXS evaporator: Finned coil, diameter 5 mm, 390*50*152 mm
- HXS finned coil condenser, diameter 5 mm, 360*37*255 mm

Heez solution

Heez controller
- Single DC-I/O-logic inverter control solution;
- Built-in EEV driver;
- Direct 310 VDC bus and AC modulation for EC fans;
- Voltage stabiliser not needed.

User interface
- NFC technology and optional Bluetooth;
- Backlit buttons and multicolour icons.

EEV stepper valve
- Continuous, equal percentage modulation;
- Maximum performance during the pull-down stage;
- Compressor safety functions.

Variable-speed EC fans
- High efficiency modulation;
- Maximum performance during the pull-down stage;
- Low noise.

R290 rotary DC inverter compressor

General specifications	
Compressor	Orione M1 R290 DC Inverter Rotary
Driver	Heez control solution with active PFC
Certification	UL/EN60335-2-34, with AA, CCC UL/EN60730, full EMC compliance

Data in steady state	
Operating conditions	25°C ambient, 2.5°C product, -5°C evap/35°C cond, SH 7K, SBC 5K. 17-30rps
Cooling capacity	140-250 W
COP	3.5

Data in half reload recovery	
Operating conditions	5°C ambient, 2.5°C product 5°C evap/48°C cond, SH 7K, SBC 8K. 90rps
Cooling capacity	1050 W
COP	3.5

Numbers in brief

25°C 60% rH — **K3 classe** (-3.5°C to 1°C, AVG ≤ -1°C)

25°C 60% rH — **K2 classe** (-1°C to 6°C, AVG ≤ 2.5°C)

32°C 65% rH

European standard EN16902:

Energy consumption		CC1/K3	CC1/K2	CC2/K2
Active mode	kWh/12h	0.678	0.566	0.793
Standby mode	kWh/12h	0.38	0.287	0.478
Total power consumption	kWh/24h	1.058	0.853	1.271

Standby in recovery and ramp down		CC1/K3	CC1/K2	CC2/K2
Standby recovery duration	hours	3.8	3.6	3.6
Ramp down duration	hours	27.4	35.8	19.1
Maximum duration allowed	hours	4	4	4

Half Reload Recovery		CC1/K3	CC1/K2	CC2/K2
Half Reload Recovery FAST mode	hours	7	5	6.5
Half Reload Recovery ECO mode	hours	11.2	11.2	14.3
Maximum duration allowed	hours	13	13	16

Gross volume *397 l*

Energy Consumption **0.85 kWh/day**

EEI **-47%**(*)
VS TopTEN.eu BEST COOLERS AVERAGE

HRR **-62%**
5 h VS 13 h
Half Reload Recovery

75.2°F ± 1.8°F 57% rH

38°F ± 2°F

US standard DOE 2017:

DOE 2017 self contained - vertical transparent cabinet (SC-VCT)		
Maximum power consumption allowed	kWh/24h	2.262
Total power consumption	kWh/24h	1.082

DOE 2017 self contained - pull down cabinet (SC-PD)		
Maximum power consumption allowed	kWh/24h	2.352
Total power consumption	kWh/24h	1.082

Energy star self contained - vertical transparent cabinet (SC-VCT)		
Maximum power consumption allowed	kWh/24h	1.777
Total power consumption	kWh/24h	1.082

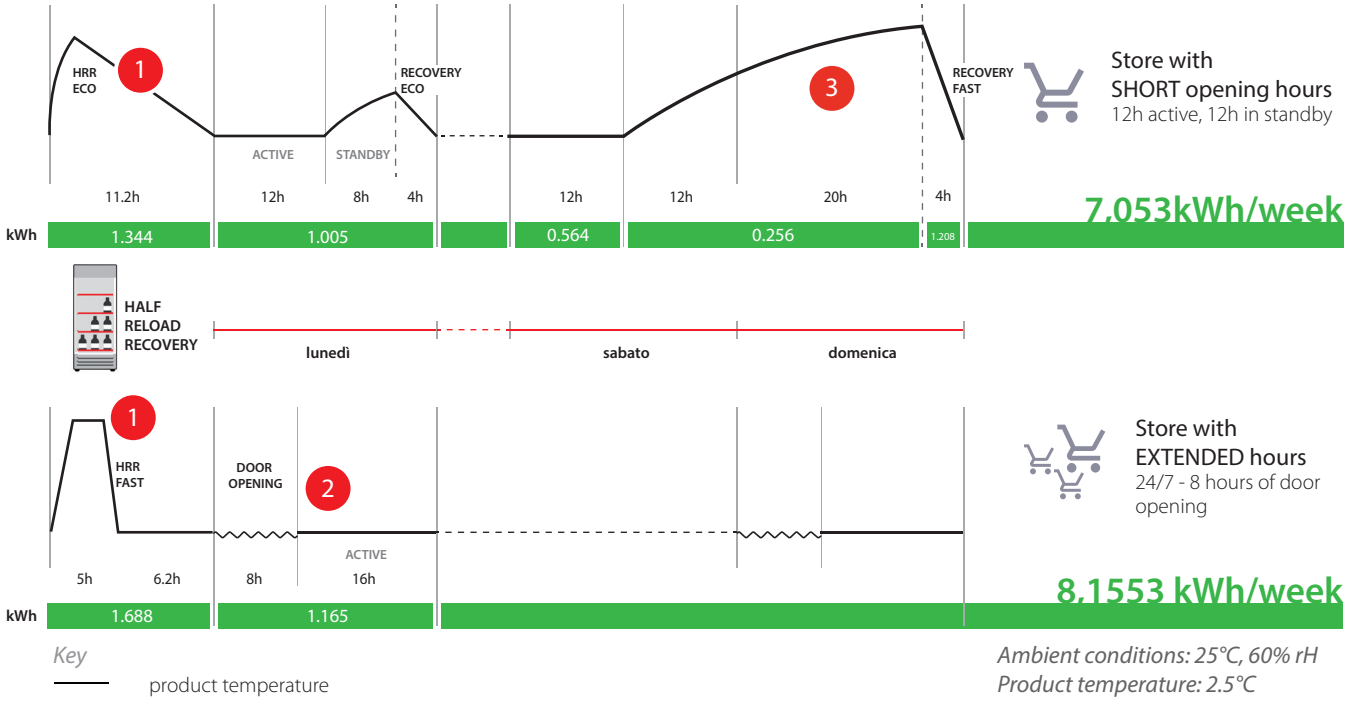
Gross volume *14.02 ft3*

Energy Consumption **1.08 kWh/day**

DOE 2017 **-52%**
Vs 2.262 kWd/d

Energy star **-39%**
Vs 1.777 kWd/d

Analysis of dynamics and power consumption expected in the application



1. *Double pull-down mode with priority on performance (FAST) or power consumption (ECO). ECO mode exploits machine-learning algorithms to calibrate pull-down duration in accordance with the requirements of standards in force.*
2. *High temperature stability in conditions with frequent door openings.*
3. *Thanks to the high cooling capacity delivered during the FAST recovery stage, the cooler can be kept in standby for a longer period, with consequent energy savings.*

Conclusions

The tests conducted at ReGent on a beverage cooler equipped with Heez showed how significant results can be achieved in terms of energy saving:

- -47%(*) compared to the best market coolers, in accordance with the test protocol relating to European standard EN16902;
- -52% compared to the limits set in US standard DOE2017.

(*) Data processed by CAREL with reference to TOPTEN.eu best cooler, EEI average @ M2 class (-1°C to 7°C) 25°C. Data updated as of September 2017

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