

A stylized illustration of an iceberg. The top part of the iceberg is visible above a horizontal line, while the much larger, submerged part is below the line. The iceberg is composed of various shades of blue, from light to dark, creating a faceted, crystalline appearance. The background is a gradient of light blue at the top, transitioning to a dark blue at the bottom.

BEYOND
THE BROCHURE

EXPOSING THE REALITY OF REFRIGERATION PRODUCT UNDERPERFORMANCE

Independent, third-party product performance certifier, Eurovent Certita Certification, has released a new white paper revealing major gaps between unverified manufacturer data and measured performance.

Drawing on both established and new research, the paper examines the performance of heat rejection equipment using HFC and natural refrigerants (CO₂). This key findings report exposes the results of independent testing, highlighting the operational and commercial risks of inaccurate product data.

KEY FINDINGS

WHITE PAPER OVERVIEW

Beyond the brochure: Exposing the reality of refrigeration product underperformance, explores key issues in the refrigeration sector while building on established research on non-certified HFC air-cooled condensers and non-certified CO₂ Gas Coolers. Central to the white paper is the results of a new comprehensive test campaign on uncertified CO₂ Gas Coolers. Using the results from the HFC study and new research, the white paper simulates the impact of underperformance on two supermarket applications: one utilising HFC refrigerants, one utilising CO₂. The white paper concludes with an overview of product performance certification and its role in safeguarding the industry.

DISCLAIMER

This short version of the white paper has been produced by Eurovent Certita Certification for informational and educational purposes only.

The analyses, results and conclusions presented herein are based on a defined scope of work, a limited sample of products, specific assumptions, and test conditions as described in the document. The findings reflect the outcomes of this study only and do not constitute a general assessment of the market, nor of any individual manufacturer, brand, or product. All testing, simulations and evaluations were conducted using recognised standards, independent laboratories and professional tools, in accordance with the methodologies described.

References to market practices, performance deviations, or environmental claims are made at a general level and are not intended to imply misconduct, non-compliance, or misrepresentation by any specific company.

Eurovent Certita Certification does not accept liability for decisions made based on this document outside the scope of its intended use.

KEY LABORATORY TEST CAMPAIGN RESULTS

Past studies revealed that certain products without third-party verification could display significant deviations between claimed and expected performance:

HFC Study: Uncertified HFC air-cooled condensers showed measured heat rejection **capacity up to 32.54% lower** than claimed by the manufacturer, with performance gaps also found in air flow and power input.

Table 1: Deviation between the measured and claimed performance

Performance	Air-cooled HFC condenser 1	Air-cooled HFC condenser 2	Air-cooled HFC condenser 3
Heat rejection capacity	-17,42%	-32,54%	-8,04%
Air flow	-4,62%	-20,38%	1,57%
Power input	-21,05%	-25,68%	-15,38%

The sign “-” means underperformance

NEW TEST CAMPAIGN (2025)

Eurovent Certita Certification put two **uncertified CO₂ gas coolers** through a comprehensive evaluation process. Initially five uncertified CO₂ gas coolers were randomly selected and evaluated by Eurovent Certita Certification via data analysis and simulations using a professional design tool. The results showed that only one of the five uncertified CO₂ gas coolers was expected to perform as claimed. The two units with the highest risk of underperformance were selected for laboratory testing. Tests followed strict protocols (EN327 for heat rejection, EN 13487/EN ISO 9614-1 for acoustics) and were based on the Eurovent Certified Performance for Heat Exchangers test protocol.

Both units were evaluated across 5 different market conditions, including:

- **Condition 1:** Standard transcritical condition (known as SC20)
- **Condition 2:** Market transcritical condition at High ambient T with 2K approach used in warm weather areas
- **Condition 3:** Market transcritical condition with 3K approach used in central and Northern European market
- **Condition 4:** Market transcritical condition with 2K approach used in central and Northern European market
- **Condition 5:** Standard subcritical condition (Condenser) known as SC25.

Eurovent Certita Certification uses correction factors during its certification process to translate performance from standard SC20 conditions to nine predefined market conditions covering all major climate zones. The test campaign focused on validating conditions most relevant in Central and Northern Europe as this is where market performance claims are often most unrealistic.

KEY FINDINGS FROM LAB TESTS

HEAT REJECTION CAPACITY:

- Both units displayed a small positive deviation at standard condition SC20.
- In Central and Northern European climates the highest measured deviation was a **53% underperformance**
- In warm weather climates the highest deviation was a **37% underperformance**
- The highest deviation in subcritical mode was a **32% underperformance**.

Acoustic performance:

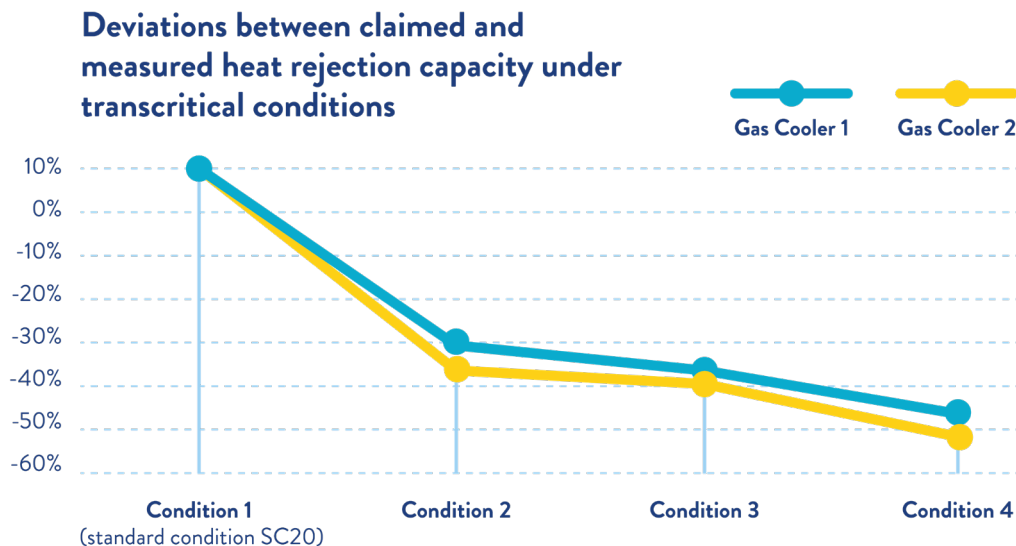
- One unit had a **5 dB(A) deviation** from claimed sound levels.

Table 2: Deviations between claimed and measured heat rejection capacity for subcritical condition

Operating Conditions	Gas Cooler 1	Gas Cooler 2
Condition 5 (standard condition SC25: condenser)	-32%	-23%

The sign “-” means underperformance

Figure 1: Evolution of deviation between the claimed and measured heat rejection capacity of gas coolers under transcritical conditions



See the full results in [Beyond the brochure: Exposing the reality of refrigeration product underperformance.](#)

IMPACT ON WHOLE SYSTEM PERFORMANCE

Heat rejection equipment is a critical part of the refrigeration system. Underperforming components increase energy use, costs, and carbon emissions over the system's lifetime.

Two identical supermarket applications were simulated using underperforming heat rejection equipment.

Figure 2: Impact of an underperforming CO₂ installation with a gas cooler operating under condition 4, with an underperformance rate of 11.6% vs baseline

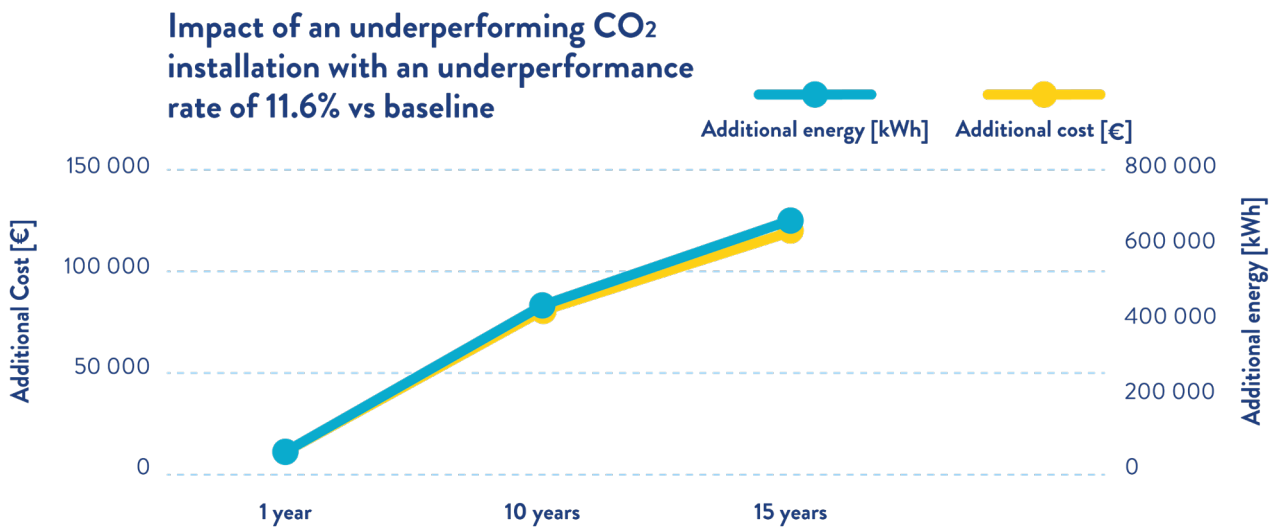


Figure 3: Impact of an underperforming HFC installation with an underperformance rate of 11.7% vs baseline

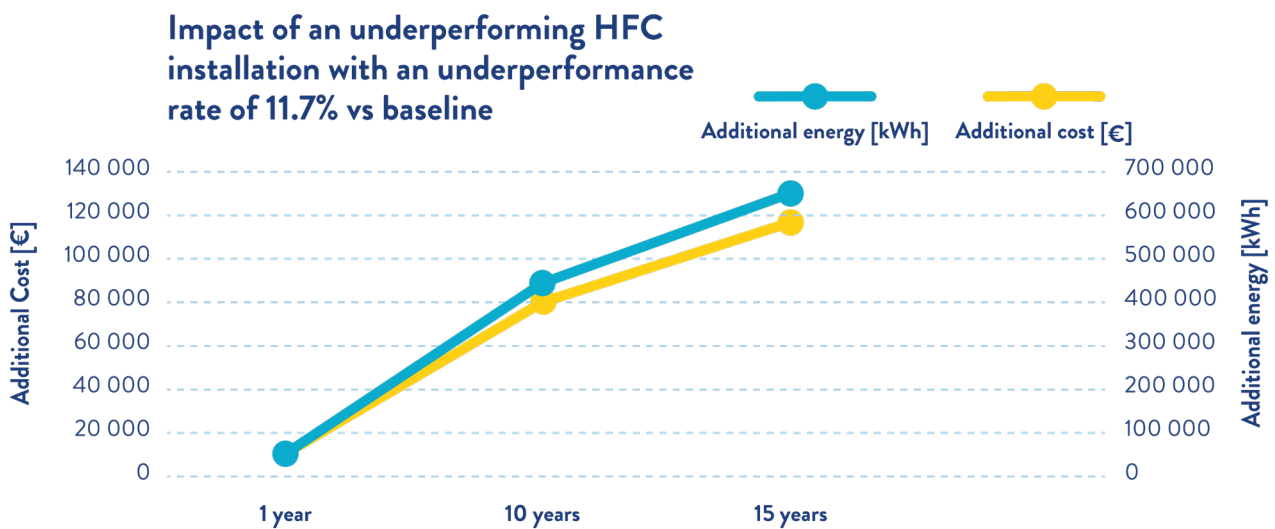
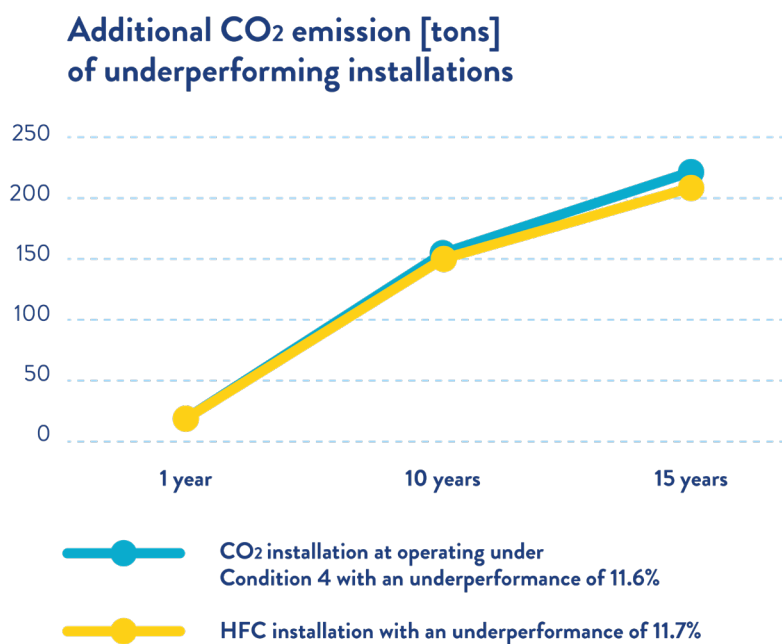


Figure 4: comparison of additional CO₂ emissions between underperforming HFC and CO₂ installation



WHOLE LIFE CYCLE UNDERPERFORMANCE

Both systems will:

- Use at least 650000 kWh in additional energy
- Cost in excess of 117,000€ extra to run
- Produce over 219 tonnes of avoidable CO₂ emissions.

The systems also underwent simulations across different underperformance rates. The results showed that even small gaps in claimed vs. measured performance have significant long-term impacts. See the full results in Beyond the brochure: Exposing the reality of refrigeration product underperformance.

SOLUTIONS AND RECOMMENDATIONS

Product and system underperformance remains a significant risk in the refrigeration industry. Eurovent Certita Certification's investigations show that only one in five randomly selected uncertified CO₂ gas coolers were expected to perform as claimed, with the poorest tested unit showing a 53% gap between declared and measured performance under non-standard conditions. When combined with earlier findings on HFC condensers, the analysis demonstrates that heat rejection underperformance has serious system-wide consequences, driving more than 43,000 kWh of additional energy use per system, over €7,800 in extra operating costs, and at least 14.7 tonnes of additional CO₂ emissions per year of operation.

The test campaign also confirmed the validity of Eurovent Certita Certification's correction factors. Ultimately, the findings highlight the need for decision-makers to look beyond brochure data and rely on independently verified performance.

WE BUILD TRUST

Eurovent Certita Certification has been certifying products since 1994 and is recognised as a world leader in voluntary, third-party product performance certification, for the HVACR industry. Its partner laboratories and agencies are located across the globe and are regularly assessed according to ISO/IEC 17025. All have been carefully selected for their ability to test products to each programme scope and exacting standards. For a full list of partner laboratories please see www.eurovent-certification.com

Eurovent Certita Certification is an accredited certification body, recognised by Cofrac with accreditation number 5-0517. The scope of accreditation is available on www.cofrac.fr.



We build trust.

Eurovent Certita Certification SAS
34 rue Laffitte 75009 PARIS, France

Telephone: +33 (0)1 7544 7171

www.eurovent-certification.com



Follow us on

LinkedIn

