

TSX Series ultra-low temperature freezers



Introduction

We are committed to designing our products with the environment in mind—it's part of how we support our mission to enable our customers to make the world healthier, cleaner, and safer. This fact sheet provides the rationale behind the environmental claim that Thermo Scientific™ TSX Series ultra-low temperature (ULT) freezers meet ENERGY STAR criteria and are more energy efficient than some conventional-refrigerant freezer models, while delivering superior total performance for temperature management and reliability.

Product description

The TSX Series ULT freezers (Figure 1) feature V-drive adaptive control technology, designed to minimize energy consumption without sacrificing sample security. While conventional ULT freezers use single-speed compressors that continually cycle on and off, the V-drive runs the compressors at variable speeds, adjusting cooling performance to the cooling demands inside and outside the freezer. When conditions are stable, the V-drive controls the system at low speed, which helps reduce energy consumption while maintaining a stable temperature for sample protection. When there are frequent door openings or samples being added to the freezer, the system detects the activity and increases the drive speed (Figure 2).



Figure 2. Adaptive control of cooling. The V-drive technology featured in TSX Series freezers is designed to detect conditions such as multiple door openings and adjust to a higher compressor speed when required.



Figure 1. TSX Series ULT freezer. Available in four sizes, the smallest unit, the TSX40086 freezer shown here, can hold up to 400 boxes in a 7.42 sq. ft. footprint, while the largest unit, the TSX70086 freezer, can hold up to 700 boxes in an 11.86 sq. ft. footprint.

In addition to these energy-saving features, TSX Series freezers use non-hydrofluorocarbon (HFC) refrigerants, which help reduce environmental impact and further increase cooling efficiency. HFC refrigerants have been identified by the U.S. Environmental Protection Agency [1] and European Commission [2] as powerful greenhouse gases with significant global warming potential. We are phasing out HFC refrigerants in our freezers and refrigerators in favor of more environmentally friendly alternatives that offer better cooling efficiency, improved thermal performance, and increased system reliability. Also, the foam insulation is water-blown, which helps reduce the chemical emissions and outgassing that are common with other foam products.

Our commitment to environmental responsibility doesn't end there. Our freezers and refrigerators are manufactured in a facility that has achieved zero waste to landfill, meaning that more than 90% of the waste generated at our manufacturing site is diverted from landfill [3]. Finally, the TSX Series ULT freezers operate at 45.5–49 dB, a noise level similar to that of a library [4]; this allows them to be located conveniently inside the lab.

Green feature
Energy efficient

TSX Series ULT freezers are among the 18 TSX freezer models that have earned ENERGY STAR certification. The ENERGY STAR mark is the U.S. government-backed symbol for energy-efficient choices. The certification program aims to provide simple, credible, and unbiased information to help consumers and businesses make well-informed purchasing decisions. The U.S. Environmental Protection Agency ensures each qualified product is independently certified to deliver expected quality, performance, and savings.

TSX Series ULT freezers not only meet ENERGY STAR requirements but also offer greater energy efficiency than some conventional-refrigerant freezers. For example,

the TSX40086D model uses 15% less energy compared to the Eppendorf™ F570h freezer to operate at –80°C; the TSX60086D model uses 17% less energy than the Eppendorf™ F740hi freezer (Table 1). Power consumption (kW) for each model is based on either ENERGY STAR specifications or manufacturer-published specifications with the temperature set to –80°C. Power consumption was measured for a 24-hour span to determine daily energy usage (kWh/day). Measurements were conducted at ambient temperature, similar to typical laboratory conditions. The “energy use reduction” percentage represents the energy efficiency gain when switching to the specified TSX model from the model shown. Choosing the TSX40086D freezer over the Eppendorf F570h freezer would help save more than 595 kWh of energy over the course of a year, representing 0.442 metric tons of CO₂ equivalents [5] and annual savings of approximately \$65 [6].

TSX Series ULT freezers are designed to meet the highest protection and sustainability standards. While some ULT freezer designs from other suppliers may further minimize energy consumption, they do so at the expense of critical performance factors—including cabinet temperature variation and door opening recovery—thereby compromising sample protection. TSX Series freezers deliver superior total performance and strike a balance that optimizes sustainability, reliability, and temperature management to provide sample protection as well as energy efficiency benefits.

Additional energy savings can be obtained by running the TSX Series ULT freezers at a –70°C set point (6.5 kWh/day for the TSX40086D model and 7.8 kWh/day for the TSX60086D model—24–31% additional energy savings when compared to the –80°C set point). Beyond these benefits, TSX Series ULT freezers emit less heat into the room, which may help lower heating, ventilation, and air conditioning (HVAC) costs. In total, these benefits represent a win for our customers, our company, and the planet.

Table 1. Comparison of energy usage between TSX Series and conventional freezers operating at –80°C.*

Freezer model	Power usage (kWh/cu. ft./day)	Daily energy usage (kWh/day)	Energy use reduction	Annual CO ₂ equivalents (metric tons)	Average annual operational cost
TSX40086D	0.39	9.4	15%	2.6	\$377
Eppendorf F570h	0.46	11.1		3.0	\$445
TSX60086D	0.47	10.2	17%	3.0	\$449
Eppendorf F740hi	0.51	12.3		3.3	\$493

* Data from: energystar.gov/productfinder/product/certified-lab-grade-refrigeration/details/2301322, energystar.gov/productfinder/product/certified-lab-grade-refrigeration/details/2307791, energystar.gov/productfinder/product/certified-lab-grade-refrigeration/details/2322056, energystar.gov/productfinder/product/certified-lab-grade-refrigeration/details/2319106.

References

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2. European Commission. Fluorinated greenhouse gases. ec.europa.eu/clima/policies/f-gas_en
3. 90% diversion is based on internal audits. Certification is pending.
4. IAC Acoustics. Comparative examples of noise levels. [industrialnoisecontrol.com/comparative-noise-examples.htm](https://www.industrialnoisecontrol.com/comparative-noise-examples.htm)
5. U.S. Environmental Protection Agency. Greenhouse Gas Equivalencies Calculator. [epa.gov/cleanenergy/energy-resources/calculator.html](https://www.epa.gov/cleanenergy/energy-resources/calculator.html)
6. Based on an energy rate of \$0.1098 as reported by the U.S. Energy Information Administration as the national average commercial rate. [eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a](https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a)

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