

## TDE Series ultralow 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™ TDE Series ultralow temperature (ULT) freezers are energy efficient, use up to 10% less energy than prior new models, and up to 42% less energy than prior models that are in use and aging.

### Product description

The TDE Series ULT freezers are designed for ease of use with a focus on product reliability and performance. Powered by the H-drive hydrocarbon refrigeration system, the TDE Series models deliver sample security with a focus on operational savings and usability. The hybrid touchscreen user interface pairs modern elegance with functional simplicity in a ULT freezer for today's lab.

In addition to these energy-saving features, TDE Series ULT freezers use natural, non-hydrofluorocarbon (HFC) refrigerants, which help reduce environmental impact and further increase cooling efficiency. The United States Environmental Protection Agency [1] and European Commission [2] have identified that HFCs are powerful greenhouse gases with significant global warming potential. We are phasing out the use of these refrigerants in our freezers and refrigerators in favor of hydrocarbon (HC) alternatives, which are more environmentally friendly. Additionally, the foam insulation in TDE Series freezers

is water blown, which helps reduce the chemical emissions and outgassing that are common in other foam products.

TDE Series ULT freezers have completed the ACT™ Environmental Impact Factor Label process, which is designed to meet the needs of both scientists and procurement specialists. It is meant to make clear how lab products affect the environment. Input from industry experts and external stakeholders was used to develop ACT label criteria; third-party verification of the sustainable impact of a product, its operation, and its end-of-life cycle is part of the certification process.



For additional information on the ACT label, go to [thermofisher.com/actlabel](https://thermofisher.com/actlabel).

Our commitment to environmental responsibility doesn't end there. Our freezers and refrigerators are also manufactured in a zero waste to landfill—certified facility [3], which means that more than 90% of the waste generated at the manufacturing site is diverted from landfills.

- Our lab freezers and refrigerators are manufactured with 60–70% recycled steel
- We use locally sourced and 100%-by-weight recycled corrugated packaging
- We have green recycling programs for retired cold storage

Finally, TDE Series ULT freezers are relatively quiet, operating at



### Green benefits

- **Energy efficient**—use up to 41% less energy than prior models and up to 52% less energy than aging prior models
- **Save an additional 36–39% energy at a –70°C setpoint**

50–52 decibels, a similar noise level to a home conversation [4]. This allows the freezers to be conveniently located inside the lab rather than relegated to the hallway.

### Energy efficient

TDE Series ULT freezer models TDE40086FD and TDE60086FD use up to 41% less energy than the prior models TSE400D and TSE600D, respectively (Table 1). The energy savings are even more significant when comparing the TDE Series ULT freezers against 5-year-old models—TDE Series models use up to 52% less energy. Aging and the design of the previous models leave them more susceptible to performance degradation, which can come in the form of insulation degradation over time and loss of refrigeration system efficiency.

Based on this degradation, quantitative modeling calculations were conducted, which estimate the increased energy consumption for a unit that has been in operation for more than 5 years.

Choosing a TDE40086FD ULT freezer over a legacy TSE400D would reduce energy use by 41%, saving 2,665 kWh over the course of 1 year. This savings represents 2.0 metric tons of CO<sub>2</sub> equivalents, or the greenhouse gas emissions from driving 4,888 miles in the average passenger car [5]. It also translates into an energy cost savings of \$281 annually [6], based on commercial sector electricity rates. When comparing a TDE40086FD model to an aging TSE400D, the energy use reduction is 52%, saving 4,161 kWh over the course of 1 year. This savings represents 3.0 metric tons of CO<sub>2</sub> equivalents, or the greenhouse gas emissions from driving

7,250 miles in the average passenger car [5]. This would translate into an energy cost savings of \$441 annually [6].

Energy and cost from using heating, ventilation, and air conditioning (HVAC) should also be taken into consideration when evaluating the total energy usage for larger equipment. Heat generated by a freezer is displaced into the room and must be removed by the HVAC system. TDE Series ULT freezers emit less heat into the room, which lowers HVAC costs. For example, the TDE40086FD model emits 1,474 BTU/hr compared to 3,099 BTU/hr for a 5-year-old TSE400D model. Therefore, choosing the TDE40086FD model to replace an aging TSE400D unit could translate into a total energy cost savings of \$565 annually (Table 2) [6].



TDE Series ULT freezer  
(Cat. No. TDE60086FD).

**Table 1. Comparison of energy usage between TDE Series ULT freezers and prior models (new and aging) operating at –80°C.**

Freezer model (Cat. No.)	Energy use per storage volume (kWh/day/cu ft)	Daily energy usage (kWh/day)	Energy usage change relative to TDE model	Annual CO <sub>2</sub> equivalents (metric tons)	Annual unit operational cost*
TDE40086FD	0.54	10.4	–	2.6	\$400
TSE400D (new)	0.77	17.7	+41%	4.6	\$681
TSE400D (5 years old)	0.95	21.8	+52%	5.6	\$841
TDE60086FD	0.46	13.3	–	3.4	\$512
TSE600D (new)	0.64	18.1	+26%	4.6	\$696
TSE600D (5 years old)	0.81	22.6	+41%	5.8	\$871

\* Does not include costs related to HVAC.

**Table 2. Comparison of energy usage between TDE Series ULT freezers and prior models (new and aging) operating at –80°C including HVAC energy usage.**

Freezer model (Cat. No.)	HVAC daily energy usage* (kWh/day)	Total energy usage (kWh/day)	Annual CO <sub>2</sub> equivalents (metric tons)	Annual unit operational cost*
TDE40086FD	3.0	13.4	3.5	\$515
TSE400D (new)	5.0	22.7	5.8	\$873
TSE400D (5 years old)	6.2	28.1	7.2	\$1,080
TDE60086FD	3.8	17.1	4.3	\$660
TSE600D (new)	5.1	23.2	6.0	\$894
TSE600D (5 years old)	6.4	29.1	5.8	\$1,119

\* HVAC energy calculation based on an average seasonal energy efficiency ratio (SEER) of 12.

**References**

1. [epa.gov/snap](http://epa.gov/snap)
2. [ec.europa.eu/clima/policies/f-gas\\_en](http://ec.europa.eu/clima/policies/f-gas_en)
3. 90% diversion is based on internal audits. Certification is pending.
4. [industrialnoisecontrol.com/comparative-noise-examples.htm](http://industrialnoisecontrol.com/comparative-noise-examples.htm)
5. US EPA Greenhouse Gas Equivalencies Calculator, [epa.gov/cleanenergy/energy-resources/calculator.html](http://epa.gov/cleanenergy/energy-resources/calculator.html), accessed 16 September 2019.
6. Based on an energy rate of \$0.1055 as reported as the national average Commercial rate by the US Energy Information Administration. [eia.gov/electricity/monthly/epm\\_table\\_grapher.cfm?t=epmt\\_5\\_6\\_a](http://eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a), accessed 23 July 2019.

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