



TCP ULTRA THERMAL COVER

High thermal protection / Technical Data Sheet

Document No.	PRT-TDS-TCP-ULT-00
Revision	00
Product family	TCP™ Thermal Pallet / Cargo Covers
Manufacturer	PROtONE Packaging & Insulation Solutions Ltd, Sderot, Israel

Recommended use: especially demanding / high-risk applications

1. Product Description

TCP ULTRA is PROtONE's high-tier thermal pallet/cargo cover, built around the POLYNUM ULTRA insulation material, suited to especially demanding applications. Its base insulation material has been measured, on PROtONE-manufactured POLYNUM ULTRA-based thermal covers already in service, with an installed cover thermal resistance of up to $3.72 \text{ m}^2 \cdot ^\circ\text{C}/\text{W}$.

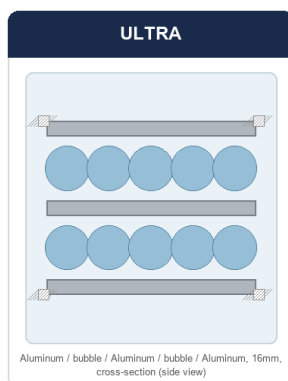
TCP™ covers are custom-made thermal covers intended to reduce the rate of temperature change and protect temperature-sensitive goods against external temperature fluctuations during storage and transportation.

2. Key Benefits

- Reduces the rate of temperature change through radiant, conductive, and convective heat transfer.
- Reflects 95–97% of incident radiant heat via an aluminum reflective facing.
- Installed cover thermal resistance has been measured in real PROtONE production covers (not modeled).
- Reusable, lightweight, and easy to install despite the increased thickness.
- Custom-made to fit any pallet or cargo configuration.
- Manufactured in Israel (Sderot).

3. Construction

TCP ULTRA is a five-layer laminate: aluminum foil, an 8.0 mm large-bubble layer, a shared internal aluminum foil, a second 8.0 mm large-bubble layer, and a final aluminum foil, for 16.0 mm total thickness. Both air gaps are fully symmetric (reflective on both sides), giving conductive insulation (from the material thickness) and radiative insulation (a reflective face on both sides of each gap).



4. Technical Data

Property	Value
Insulation material	POLYNUM ULTRA
Layer structure	Aluminum / bubble / aluminum / bubble / aluminum; two symmetric air gaps in series
Nominal thickness	16.0 mm
Bubble diameter	30 mm
Reflective facing type	Aluminum foil, ≥99.0% purity, ≥8.0 microns
Reflectivity (radiative heat reflection)	95–97%
Emissivity	3–5%
Weight	375 g/m ²
Independent lab thermal resistance (SII guarded hot plate, material only)	≈0.45 m ² ·°C/W at 10°C mean test temperature
Installed cover thermal resistance (measured on PROtONE POLYNUM ULTRA-based thermal covers)	Horizontal: 3.72 m ² ·°C/W; Vertical: 2.50 m ² ·°C/W
Material thermal resistance (typical, various building applications)	2.50–4.90 m ² ·°C/W (roof/wall reference values per POLYNUM ULTRA Technical Data Sheet)
Temperature limits	Not specified

Values not directly supported by source documentation are marked “Not specified.” No values in this table have been estimated to fill a gap.

5. Cover Configuration & Options

- Custom dimensions manufactured to customer requirements; no fixed standard size.
- Opening can be located on any side of the cover according to customer requirements.
- Opening secured by hook-and-loop (VELCRO®) closure.
- Optional transparent Packing List document pouch; location and dimensions to customer requirements.



- Other configurations, materials, and closures can be supplied upon request.

6. Applications

TCP ULTRA Thermal Cover is suited to applications where passive thermal protection is required, including:

- Pharmaceutical logistics (vaccines, insulin, and other temperature-sensitive drugs)
- Food products and food e-commerce
- Temperature-sensitive industrial goods
- Air freight
- Road transportation
- Storage applications

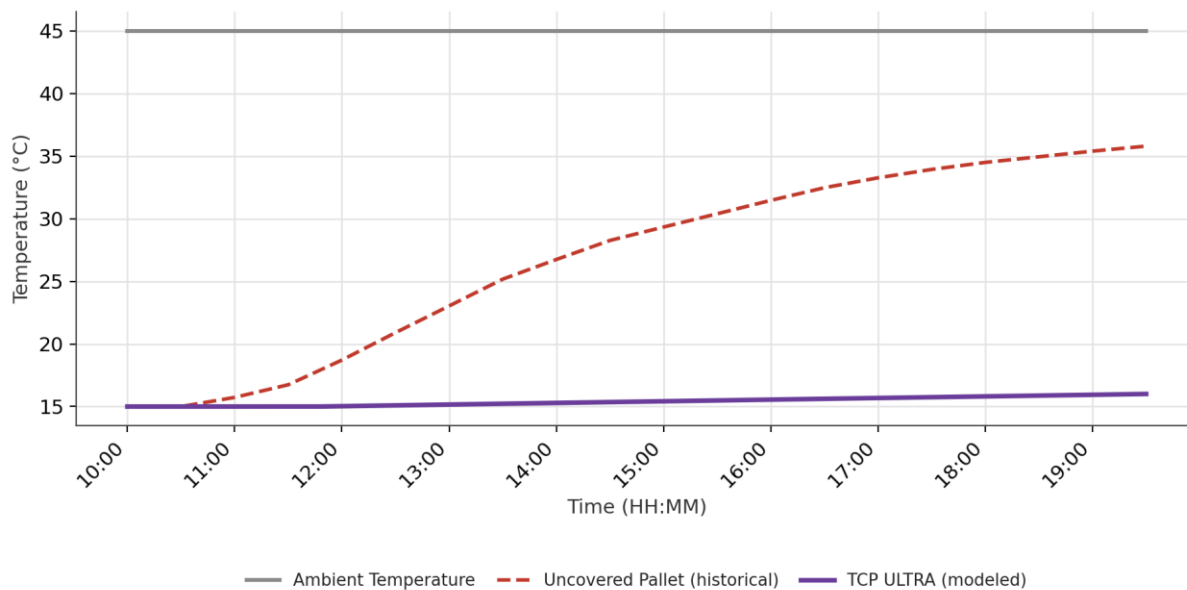


7. Representative Thermal Performance

TCP ULTRA has not been independently chamber-tested as a complete cover system in the specific TCP-1LPM1LB0SO test configuration. The curves below are calculated representative estimates, modeled from a historical PROtONE thermal-cover chamber-test baseline and scaled by a physical model of thermal resistance that combines conductive resistance (from the real 16.0 mm material thickness) and radiative resistance (from two fully symmetric reflective air gaps in series), fitted to independent laboratory k-value testing of POLYNUM ULTRA and validated against the measured installed cover thermal resistance shown above.

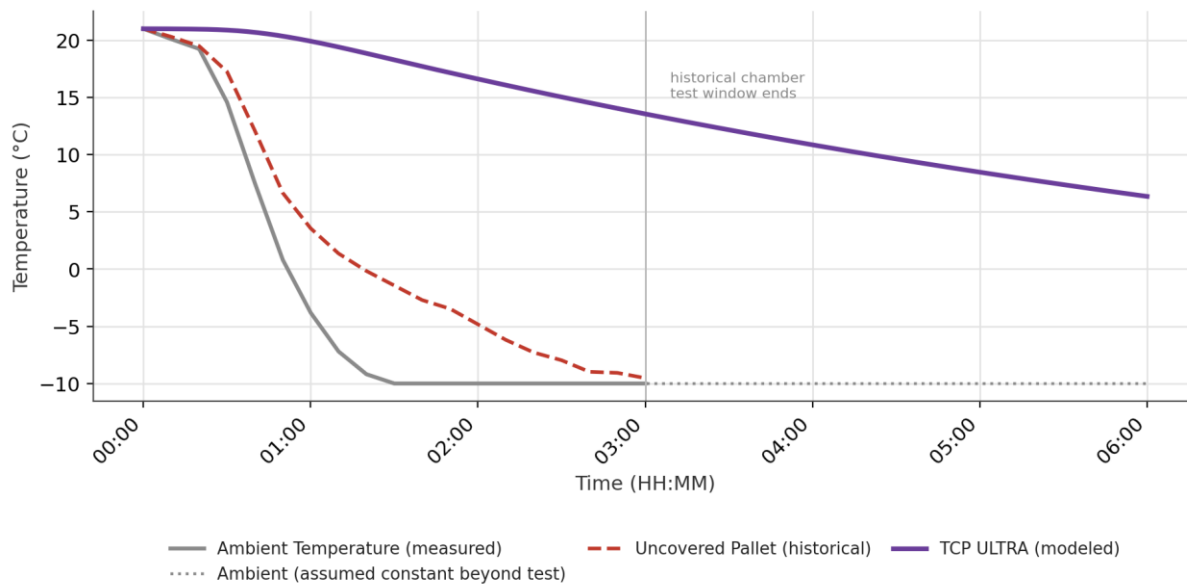
8. Performance Graphs

Representative Thermal Performance - Hot Environment
(TCP-1LPM1LB0SO chamber test, ambient $\approx 45^{\circ}\text{C}$, 9.5 h)





Representative Thermal Performance - Cold Environment
(TCP-1LPM1LB050 chamber test, ambient to $\approx -10^{\circ}\text{C}$, modeled to 6h)



These curves are calculated representative estimates, modeled from historical PROtONE thermal-cover chamber-test data and scaled by a physical model of this construction's thermal resistance (material thickness and reflective-facing symmetry), fitted to independent laboratory testing; they are not independent chamber-test results for a complete cover system. In the cold-environment chart, the curve is shown extended beyond the measured historical test window, assuming a constant chamber ambient. This chart demonstrates expected behavior only; actual performance depends on load configuration, thermal mass, initial temperature, ambient conditions, air movement, solar exposure, cover fit, and closure quality.

9. Technical Notes / Limitations

- Historical data is clearly distinguished from calculated/modeled data throughout this document and in the performance graphs.
- PROtONE does not claim regulatory qualification for pharmaceutical use for this product; suitability for a specific regulated application should be validated by the customer.
- Covers are manufactured to order; lead time and minimum order quantity depend on the specific configuration requested.
- Values presented as "typical" or "representative" describe expected comparative behavior and are not a guarantee of performance in any specific use case.