

Material Specification: Industrial Inhibited Ethylene Glycol Heat Transfer Fluid

Scope

This specification governs the chemical formulation, electrical conductivity thresholds, and testing intervals for heat transfer fluids used in the liquid thermal management systems of the **Megapack X-7000** and **CompactGrid C-1200**.

Chemical Composition & Purity Requirements

- **Base Fluid:** 50.0% volume pure industrial grade ethylene glycol ($\text{C}_2\text{H}_6\text{O}_2$) blended with 50.0% volume ASTM D1193 Type II deionized water.
- **Corrosion Inhibitor Package:** Organic Acid Technology (OAT) multi-metal silicate-free corrosion inhibitor package (1.5% to 2.0% by weight). Nitrites, borates, amines, and phosphates are strictly prohibited due to abrasive degradation of internal cold-plate micro-channels.
- **Freeze Protection Rating:** Safe down to $-37.0\text{ }^{\circ}\text{C}$ ($-34.6\text{ }^{\circ}\text{F}$).
- **Boiling Point (at 1.0 bar):** $108.5\text{ }^{\circ}\text{C}$ ($227.3\text{ }^{\circ}\text{F}$).

Critical Electrochemical Limits

Because coolant circuits run in direct physical proximity to 1,000 V DC battery cell busbars, coolant electrical conductivity must remain strictly managed to eliminate ground fault risks:

- **Initial Fill Conductivity (Fresh Fluid):** $\leq 0.2\text{ }\mu\text{S/cm}$ at $25\text{ }^{\circ}\text{C}$.
- **Maximum Allowable In-Service Conductivity:** $0.5\text{ }\mu\text{S/cm}$. If fluid conductivity reaches or exceeds $0.5\text{ }\mu\text{S/cm}$, the inline deionizing filter cartridge (Part Number: **FLT-GLY-701**) must be replaced immediately.
- **pH Range:** 7.5 to 9.0 at $25\text{ }^{\circ}\text{C}$. Fluid with $\text{pH} < 7.2$ indicates acidification and requires complete system evacuation, chemical flushing, and refilling.