

Table 4: Convection model validation results. Simulation temperatures compared with industrial heat sink performance targets for typical operating conditions.

<b>Material</b>	<b>Simulation Temp (°C)</b>	<b>Absolute Temp (°C)</b>	<b>Industrial Target (°C)</b>	<b>Status</b>
Silver	30.0	51.0	40-55	✓ Realistic
Copper	29.0	50.0	45-60	✓ Realistic
Steel (carbon)	91.7	112.7	70-120	✓ Realistic
<hr/>				
<b>Convection effectiveness</b>				
Silver	38.7%	—	85-95%	Lower (high diffusivity)
Copper	50.1%	—	85-95%	Moderate
Steel (carbon)	92.9%	—	85-95%	✓ Literature match