

## LEGACY: Liquid Cooled Cold Plates

Aavid, Thermal Division of Boyd Corporation's legacy liquid cooled cold plates are custom designed to meet an application's unique thermal and mechanical requirements. To satisfy critical thermal management needs in applications as diverse as military/aerospace, medical/test equipment, power electronics, lasers, renewable energy and transportation, these liquid cooled cold plates provide the top performance and reliability designer's trust.

Custom liquid cooled cold plate options offer high performance cooling for demanding applications with high heat fluxes and power/heat loads. This small sample of Aavid's liquid cooled cold plate technologies allow the thermal designer to liquid cool high flux, high heat load devices such as IGBT/SGCT's, SCR's, Thyristers, RF, and other power electronic devices. For more information on custom liquid cooling please contact us.

### Liquid Cooled Cold Plate Construction Options

Legacy Liquid Cooled Cold Plate options include:

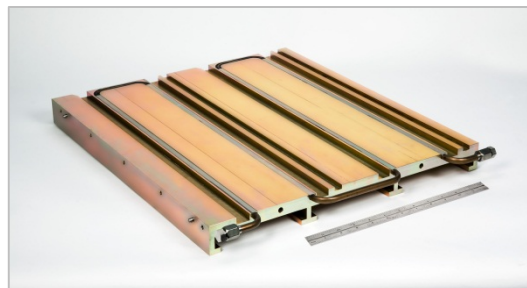
- Tube-In-Plate (Ex. in Figure 1)
  - Copper, Copper/Nickel, Stainless Tubing
  - Aluminum or Copper Plates typical
  - Soldered, Epoxied, or dip-brazed into extruded or machined plate channels
- Aluminum Vacuum-Brazed (Ex. in Figure 2)
  - Aluminum construction throughout
  - Machined fins or folded fin packs
  - Machined or welded fluid connections
- Micro-Channel (Ex. in Figure 3)
  - Aluminum or Copper Construction
  - Micro-channels
  - Brazed, machined, or welded fluid connections

### Cold Plate Internal Technology

The key to high performance Liquid Cooled Cold Plates is the variety of internal flow channel technologies.

Select from the following technologies to optimize performance for a specific application:

- Micro-Channels
- Folded Fins (>70 fins per inch possible)
- Porous metal



**Figure 1.**  
**Tube-In Plate Liquid Cooled Cold Plate**



**Figure 2.**  
**Aluminum Vacuum Brazed Liquid Cold Plates**



**Figure 3. Micro Channel Cold Plate Base**

### Liquid Cold Plate Design

- Thermal Analysis using FEA and CFD
- Internal geometry optimized to achieve required thermal performance with minimal pressure drop
- Real-world thermal and hydraulic performance validation in a controlled laboratory setting

**Table 1. Cold Plate Fluid Compatibility**

Cold Plate Technology	Water	Glycol-Water Mix	De-ionized Water	Oil	Dielectric Fluids	PAO (Polyalphaolefin)
Copper Tube-In Cold Plate	✓	✓				
Copper-Nickel Tube-In Cold Plate	✓	✓				
Brazed "Microchannel" Copper Cold Plate	✓	✓				
Brazed "Powder Metal" Copper Cold Plate	✓	✓				
Stainless Steel Tube-In Cold Plate	✓	✓	✓			
Aluminum Vacuum Brazed Cold Plates		✓		✓	✓	✓

## Coolant Fluid Options:

Liquid cooled cold plates can be engineered to perform with diverse coolants, such as water, de-ionized water, water/glycol solutions, dielectric fluids, oils and synthetic hydrocarbons (PAO). Table 1 above provides a summary of cold plate material and coolant compatibility.

## Key Features and Benefits

- ▶ **Industry Leading Thermal Performance**
  - Lower Electronic Device Case Temperatures
  - Lower System Thermal Resistance
  - Multiple Heat Source, Heat Consolidation, and Remote Cooling
  - Heat Spreading and "Isothermalization"
- ▶ **High Heat Load and Flux Capability**
  - Increased System Level Cooling Capacity
  - Increased Electronic Device Performance
  - High Heat Flux (>100W/cm<sup>2</sup>)
  - High Heat Load (>20kW+)
- ▶ **Scalable Cold Plate Technology**
  - 3 Internal Configuration Options
    - Micro-Channel or Vertical Fin Cold Plate
    - High Density Folded-Fin
    - Advanced Porous Metal Cold Plate
  - k-Core<sup>®</sup> APG and/or Heat Pipe Enhancement Options
  - Next generation needs met without significant redesign costs
- ▶ **Increased Life and Reliability**
  - Increased Electronic Device Life
  - Leak Free Performance
  - Corrosion Resistance Coatings

## Critical Application Needs

- ▶ Military/Aerospace Electronics Cooling
- ▶ Power Electronics Cooling
- ▶ Medical/Test Equipment Cooling
- ▶ Battery Cooling
- ▶ Computer CPU and GPU Cooling

## Specifications

Specifications and Options - Liquid Cooled Cold Plates	
Power / Heat Load	100W to >20kW
Effective Thermal Resistance	0.02 °C/W typical
Maximum Heat Fluxes	>100W/cm <sup>2</sup>
Cold Plate Construction	Tube-in-Plate Vacuum Brazed Microchannel welded or brazed
Cold Plate Technology	• Micro-Channels • Folded Fins (>70 fpi possible) • Porous metal
Burst/Proof Pressure*	400 psi / 2.8 MPa *Note: Higher Proof Pressures evaluated on a Case-by-Case Basis.
Fluid Interconnects	Compression fittings Quick Disconnect Barbs per SAE-J1231 Welded/Brazed
Maximum Size	>36" x 144" (1m x 3.6m)
Maximum Shock (operating/non-operating)	40G / 75G

## Other Related Technologies\*

- ▶ Embedded Heat Pipe
- ▶ k-Core<sup>®</sup> Annealed Pyrolytic Graphite (APG)
- ▶ VME-VPX Cold Plates
- ▶ Liquid Cooling System
- ▶ Ruggedized Liquid Cooling System (rLCS)
- ▶ Intelligent Thermal Management System (iTMS)
- ▶ Vacuum Brazements