

# TECHNICAL DATA SHEET

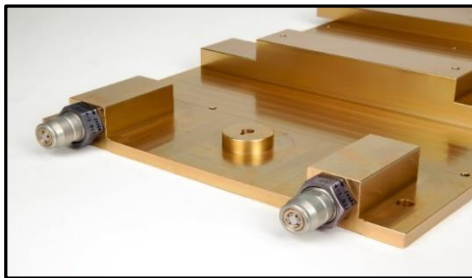
## Aluminum Vacuum Brazed Components and Assemblies

Leading the industry in the invention, development, and manufacturing of the best performing and most reliable thermal management and material solutions, Aavid now offers the complete range of engineering design and manufacturing services for aluminum vacuum brazed cold plates, heat exchangers, and chassis.

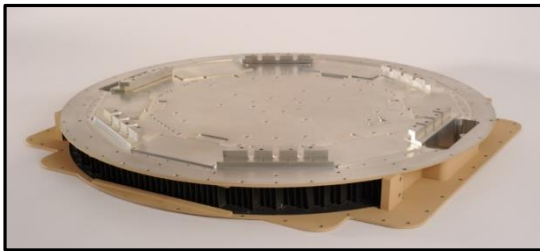
Aluminum vacuum brazed products can be found in a variety of applications in the Military/Aerospace, Medical, Power Electronics, and Communication markets.

We offer a full service business model that includes concept generation, engineering analysis, design and development, qualification, and volume manufacturing.

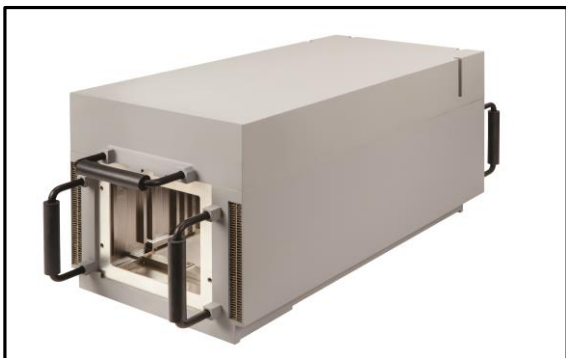
Our specialized expertise and aluminum brazing technology allows a wider variety of alloys and structural developments for stronger, more rugged and higher capacity material and thermal solutions. Aluminum vacuum brazing capabilities meet AWS and Mil-Spec industry standards.



Aluminum Vacuum Brazed Cold Plate



Aluminum Vacuum Brazed Heat Exchanger



Aluminum Vacuum Brazed Chassis

### Full Service, Integrated Capabilities include:

- Precision Aluminum Vacuum Brazing for braze joints free of brazing salts and fluxes.
- Engineering
  - Design & Development
    - Concept Generation
    - 3D Modeling & CFD Analysis
    - Thermal, Hydrodynamic, and Mechanical
    - Complex joint design for a superior joint and enhanced mechanical and thermal characteristics
  - Prototyping, Qualification, and Testing
  - Volume Manufacturing
- Pre- and Post- Brazement Precision CNC Machining
- Pre-Braze Surface Preparation and Cleaning
- Post-Braze Straightening of Brazed Assemblies
- Heat Treating/Solution Heat Treating/Tempering
  - Quenching – Submersion, Spray, Air
  - Artificial Aging
  - Annealing
- Metallurgical Assessment
  - Hardness Testing
  - Tensile Testing (coupon)
  - Metallographic Examination
  - Failure Analysis
- Acceptance Testing, including:
  - Leak Testing
    - Bubble Testing (30-100 psi pressurized inert gas)
    - Helium Leak Testing ( $10^{-9}$  std cc/sec)
    - Nitrogen leak to 3,000 psig
  - Pressure Testing
    - Hydrostatic to 10,000 psig
    - Pressure Decay Leak Testing
    - Pressure Cycle Testing
  - Non-Destructive Testing (NDT)
    - Fluorescent & Visible Penetrant Inspection (PT)
    - Ultrasonic Inspection (UT) & C-Scan Presentation
    - X-ray
  - Fluid Flow and Pressure Drop
    - Air, Water, Glycol/Water, Polyalphaolefin (PAO)
  - Thermal Verification Testing
- Mechanical Inspection
  - CMM and Optical Comparator Measurement
- Environmental Coatings
  - Anodize, Chem Film, Chromating, Plating
  - Epoxy/Adhesive Primer, Painting
- Environmental Testing
  - Thermal Shock
  - Mechanical Shock & Vibration
  - Humidity, Salt Atmosphere, Fungus, Sand and Dust
  - Altitude & Decompression, Storage
- Hardware Installation
  - Captive Screws, Pins, Threaded Inserts, HeliCoils®
  - Quick Disconnects
  - Handles
  - Custom hardware

## Brazed Components and Assemblies

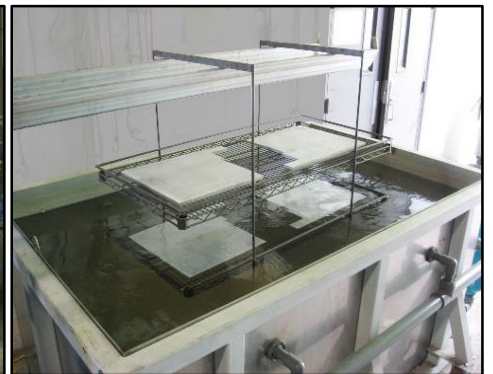
- ▶ High Surface Area & High Pressure
  - Cold Plates
    - Liquid Flow-Thru (LFT)
    - Cooling Manifolds
    - Integrated Cold Walls
  - Heat Exchangers
    - Air-to-Air
    - Liquid-to-Air
  - Chassis
    - VME/VPX , COTS, ATR
    - Liquid- and Air-Cooled Chassis

- ▶ Complex Assemblies

## Critical Application Needs

- ▶ Electronics Cooling
  - LFT Cold Plates
  - Air-Cooled Heat Sinks and Heat Exchangers
  - Liquid- and Air-Cooled Chassis
  - Complex Assemblies
- ▶ Military and Aerospace
  - Avionics
  - Power Amplifiers
  - RF Devices, MMIC
- ▶ Power Electronics Cooling:
  - IGBTs, MOSFETs, TWTs, and SGTs
- ▶ Industrial Heat Exchangers
- ▶ Automotive Batteries and Power Electronics

Industry Standards	
AWS C3.3	Recommended Practices for the Design, Manufacturer, and Examination of Critical Brazed Components
AWS C3.4	Specification for Torch Brazing
AWS C3.6	Specification for Furnace Brazing
AWS C3.7	Specification for Aluminum Brazing
AWS B2.2	Specification for Brazing Procedure and Performance Qualification
AMS 2678	Furnace Brazing of Part in a Vacuum Atmosphere
AMS 2750	Pyrometry
AMS 2770	Heat Treatment of Wrought Aluminum Parts
MIL-H-6088G, Notice 1:1997	Heat Treatment of Aluminum Alloys
AWS QC1	Certified Welding Inspectors



**Aluminum Vacuum Braze Furnace, Heat Treat Furnace, and Submersion Quench Tank**