ENGINEERING & TEST CAPABILITIES

The CAS Engineering team has extensive experience in providing custom thermal solutions, acting as an extension of your own engineering team. CAS will partner with you to take a concept through design, analysis, prototype build, testing and into production.

**DESIGN**
- The CAS New Product Development (NPD) Team leverages significant product, process and market experience to provide expertise in design and manufacturing.
- 3D Solidworks modeling utilized for all design work.

**ANALYSIS**
- Utilizing advanced Finite Element Analysis (FEA) tools, including the industry-leading Ansys software suite, CAS can perform thermal and structural analyses to evaluate the performance of a component before building prototypes.

**PROTOTYPING**
- The CAS New Product Development (NPD) Team utilizes the latest mold design and CNC programming tools, to reduce manufacturing leadtime.
- Dedicated prototype manufacturing cell, with dedicated technicians and CNC programmers.
- A variety of technologies are available to improve speed of prototyping, including sand casting and Interference Fit Construction (IFC) product solutions.
MEASUREMENT AND TEST

DIMENSIONAL AND ATTRIBUTE VERIFICATION
Dimensional attributes can be verified using the following tools in the CAS Metrology Laboratory:

- Programmable, automated Coordinate Measuring Machines (CMMs) for dimensional inspection.
- Ultrasonic Testers for non-destructive verification of the location of internal casting features such as heaters and tubing.
- Profilometers for verification of surface roughness analysis.
- Helium Leak Testers for measuring the vacuum integrity of assemblies, to specifications as stringent as $1 \times 10^{-9}$ atmosphere - cc / second.
- Pressure Testing equipment for verifying the integrity of tubing and vessels.
- Digital X-ray equipment to perform non-destructive evaluation of heater element location and casting quality. Full - size x-ray images up to 355mm x 432mm (14" x 17"). With resolution better than .1mm (.004").

FUNCTIONAL TESTING
The CAS Engineering Laboratory Services team validates prototype performance using a number of techniques:

- Temperature uniformity testing performed with surface mount sensors, infrared (IR) camera or instrumented silicon wafers.
- Atmospheric test stands and vacuum chamber 60.9cm x 60.9cm x 76.2cm (24” x 24” x 30”) for temperature uniformity and performance testing in both ambient and vacuum environments.
- Accelerated life and reliability testing, utilizing elevated voltages, operating temperatures and ramp rates. High capacity variable voltage power supplies and extensive datalogging equipment provide advanced capabilities.

PRODUCTION RELEASE
- The NPD process includes meticulous documentation which facilitates a seamless transition to production.
- All products include a customized traveler, documenting the manufacturing process and in-process inspections, and provide a methodology for collecting and analyzing data.