

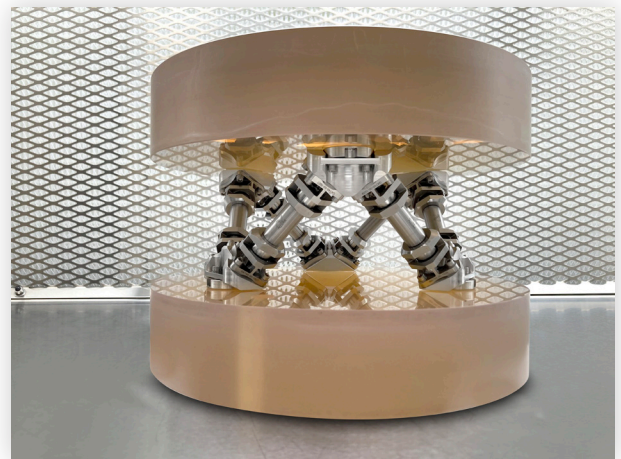
Ultra-Stable Struts

Negative CTE, Positive Results.

Ultra-Stable athermalized struts eliminate the need for costly telescope components that have long lead times by compensating for the positive CTE of other materials. This tunable CTE innovation enables telescope designers to dictate a support structure’s CTE by matching materials in a specific operating temperature range, thus passively athermalizing the system.

ENHANCED OPTIC DESIGNS:

Tailored CTE rods can reduce engineering design time, simplify optic manufacturing and alignment, and offer ultra-high stability of telescope support structures. When ALLVAR Alloy 30 is used in optical telescope assemblies, it has the following performance enhancing effects:



- Reduced Coefficient of Moisture Expansion (CME) effects and bake-out requirements by replacing some or all carbon fiber composite components.
- Reduced carbon fiber composite scrap components by adjusting the CTE of carbon fiber tubes whose CTE is out of specification.
- Enable a design-specific zero-CTE crossing determined by an application’s operating temperature.
- In-situ CTE tunability without changing strut’s metering length.
- Increased structural stiffness by eliminating nested or tube-in-tube athermalizing designs.

Potential Optic Applications:

- Intelligence, Surveillance, and Reconnaissance
- Space Systems
- Multispectral Imaging
- Metering Structures
- Telescopes

About Negative CTE

ALLVAR Alloys are the only metals in the world that shrink when heated and expand when cooled, known as a negative coefficient of thermal expansion (CTE). Commercially available ALLVAR Alloy 30 exhibits an axial -30 ppm/°C CTE at room temperature.

Compared to Invar, Titanium-based ALLVAR Alloys are:

- More corrosion resistant.
- More shock resistant.
- Lower density.
- Easier and faster to machine.

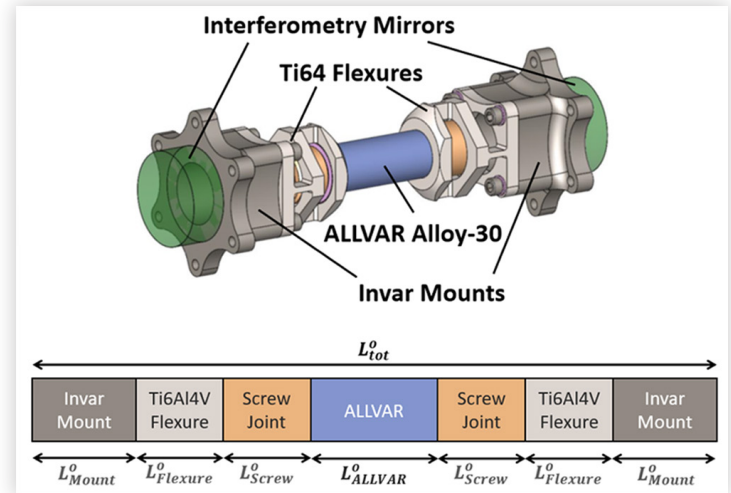
Compared to Carbon Fiber Reinforced Composites (CFRP), ALLVAR Alloys are:

- Insensitive to moisture.
- Safe and easy to machine.
- Lower cost and faster lead.

NEGATIVE THERMAL EXPANSION AT WORK:



Zero thermal expansion struts were created using negative thermal expansion ALLVAR, Ti6Al4V (Grade 5), A286 stainless steel, and Invar 36. The ultra-stable struts were designed and manufactured as part of a NASA SBIR Phase II project titled “Ultra-Stable ALLVAR Alloy Strut Development for Space Telescopes.” With design help from Quartus Engineering, these struts were designed to withstand launch conditions while being shorter and potentially lighter than alternative state-of-the-art designs. The CTE and stability of each strut was measured by the University of Florida LIGO group to quantify variability between struts. An average CTE of 0.66 ppm/°C was achieved with a standard deviation of 0.05 ppm/°C spread between the struts CTEs; exhibiting a very high manufacturing consistency. A stability of 2 pm/√Hz was achieved for the individual struts.



EXPLORE OUR RANGE OF PRODUCTS

Currently, we offer our Negative Expansion ALLVAR Alloys in Bar (up to 2.25” round) and tube (up to 3.00” OD). ALLVAR offers custom components including lens spacers, optical barrels, and struts machined by our vetted machining partners. We also offer thermal compensating washers and spacers to maintain constant pre-loads to control the margin of safety of bolted joints and lens stacks.

ABOUT ALLVAR

ALLVAR, founded in College Station, TX in 2014, manufactures revolutionary alloys with unique negative thermal expansion properties. These alloys help compensate and eliminate the detrimental effects thermal expansion causes in a variety of extreme environment applications that require high-performance. Negative thermal expansion alloys can be used to athermalize optic designs, reduce thermal stress in assemblies, maintain a constant force load, and maintain stability with thermal changes. ALLVAR’s mission is to realize long term societal benefits by rapidly transforming the scientific novelty of tailored thermal expansion alloys into useful athermalization technology.

PARTNER WITH US

To advance the Technology Readiness Level (TRL) of ALLVAR Alloys in optics applications, the ALLVAR team is looking to collaborate with prime government contractors and system integrators to design, build, and test ALLVAR Alloy athermalized optic prototypes in programs of record.

Interested in smaller, lighter, and better performing fixed focus optics? Contact us to join the athermal optic revolution!