

NASA/LaRC has a requirement for a dynamic mechanical thermal analyzer (DMA) in accordance with the minimum following specifications.

The system shall have the following features/components:

The contractor shall supply a turnkey system including fixtures, environmental chamber and dewar, all valves, hoses, and cables, instruction/training manuals, computer, and software.

Force and displacement

- DMA frequency of 0.01 to 20 Hz
- Force measurement to 15 N with 0.01% of full-scale resolution
- Actuator travel sufficient to apply dynamic tensile strains of 30% on a specimen with a cross-sectional area of at least 1 mm²; response sufficient to apply 10% tensile strain at 20 Hz
- Transient (stress relaxation, creep/recovery) as well as dynamic measurement
- Analog output of raw force/displacement waveforms to verify data quality
- Automatic adjustment of static tension (or compression or bending) during temperature scans to avoid specimen buckling (or loss of contact)
- Loss tangent ($\tan \delta$) sensitivity of at least 10^{-4}

Temperature /environmental

- Operation from -90 °C to 290 °C +/- 1 °C with liquid nitrogen cooling
- Isothermal measurements and scanning at 0.1 to 20°C/ minute under software control
- Viewport on thermal chamber

Fixturing/modes of operation

- Fixturing shall be supplied for measurements on films and fibers, on soft solids (e.g. shear, compression) and on hard plastics and fiber-reinforced composites (e.g. bending).

Software

- Transient and dynamic measurements at multiple pre-programmed temperatures, multi-frequency and multi-strain experiments with optional simultaneous temperature sweeps, all operator-programmable
- Conversion of raw data to stress, strain, compliances/moduli, and loss tangent
- Real-time display and plotting of specified measured and calculated values
- Archiving of data and test conditions and exporting as plain text

- Graphing of data with user-selectable scaling and post-processing to identify thermal transitions and to perform shifting (e.g. time-temperature superposition) and printing of results.

Computer (equivalent to NASA standard desktop)

- Intel Core i5-2400 3.1 GHz; 4 GB Ram; 500GB Hard Disk Drive; 23" LCD monitor; CD-RW drive or better

Utilities

- Instrument shall operate on 110-220V ac, up to 15 amp. Other requirements (e.g. compressed air) shall be clearly named.

Additional required items:

Training/support

- One day on-site setup and training