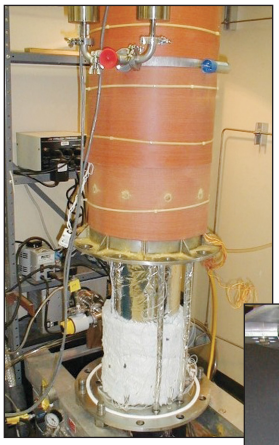
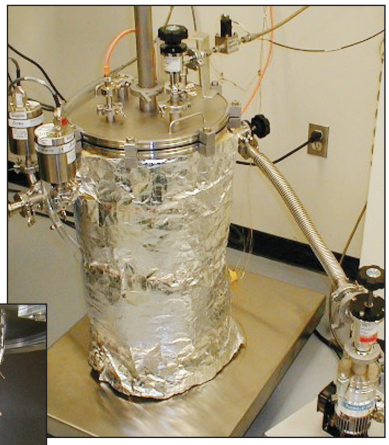
John F. Kennedy Space Center's Thermal Insulation Test Apparatuses

Thermal Insulation Test Apparatus With Sleeve (Cryostat 1)
Multipurpose Thermal Insulation Test Apparatus (Cryostat 2)
Thermal Insulation Test Apparatus for Flat Specimens (Cryostat 4)



Overall view of Cryostat-1 with the vacuum can assembly removed

View of Cryostat-2 showing the cold-mass assembly mounted on a workstand



Overall view of Cryostat-4

The National Aeronautics and Space Administration (NASA) seeks to license its Thermal Insulation Test Apparatuses. Designed by the Cryogenics Test Laboratory at the John F. Kennedy Space Center (KSC) in Florida, these patented technologies (U.S. Patent Numbers: Cryostat 1 – 6,742,926, Cryostat 2 – 6,487,866, and Cryostat 4 – 6,824,306) allow manufacturers to fabricate and test cryogenic insulation at their production and/or laboratory facilities. These new inventions allow for the thermal performance characterization of cylindrical and flat specimens (e.g., bulk-fill, flat-panel, multilayer, or continuously rolled) over the full range of pressures, from high vacuum to no vacuum, and over the full range of temperatures from 77K to 300K.

BENEFITS

- New standard test method
- Relatively quick testing
- Mobile and adaptable to different sizes and thicknesses
- Requires minimal user intervention
- High sensitivity and excellent repeatability
- Produces long-duration, steady-state measurement of heat flux through insulation test article
- Provides flexibility of pressure environments
- One-step cooling, filling, and thermal stabilization process
- Displays complete temperature profile across thickness of insulation test article for detailed performance information

opportunity

APPLICATIONS

- Thermal conductivity measurement for performance qualification of statistical quality control
- Performance range determination of standard product lines
- Assistance in new product development
- Multilayer insulation (MLI)
- Process piping and storage tanks
- Research and testing
- Refrigeration

TECHNOLOGY STATUS

- ☐ Patent pending
- ☑ U.S. Patent Numbers:
  Cryostat 1 – 6,742,926
  Cryostat 2 – 6,487,866
  Cryostat 4 – 6,824,306
- ☐ Copyrighted
- ☑ Available to license
- ☐ Available for no-cost transfer
- ☐ Seeking industry partner for further codevelopment

In today's world, efficient, low-maintenance, low-temperature refrigeration is taking a more significant role, from the food industry, transportation, energy, and medical applications to the Space Shuttle. Most countries (including the United States) have laws requiring commercially available insulation materials to be tested and rated by an accepted methodology. The new Cryostat methods go beyond the formal capabilities of the ASTM methods to provide testing for real systems, including full-temperature differences plus full-range vacuum conditions.

Technology Details

Cryostat 1 is a cylindrical test apparatus for direct measurement of the absolute thermal conductivity of a material system. This apparatus includes a cold mass and provides absolute k-values for specimens.

Cryostat 2 is a cylindrical test apparatus for measurement of the comparative k-value. This apparatus includes a cold mass and accepts specimens up to 50 mm thick.

Cryostat 4 is a flat-plate test apparatus used for comparative k-value measurements. The Cryostat 4 cold-mass assembly can be configured for rigid or soft materials, with or without compressive loads applied. An optional load cell assembly can also be provided.

Partnership Opportunities

NASA has been granted U.S. patents on the systems and is seeking licensees of the patents. NASA has the authority to grant licenses on its domestic and foreign patents and patent applications pursuant to 35 U.S.C. 207-209. NASA has implemented this authority by means of the NASA Patent Licensing Regulations, 37 CFR § 404. All NASA licenses are individually negotiated with the prospective licensee, and each license contains terms concerning commercialization (practical application), license duration, royalties, and periodic reporting. NASA patent licenses may be exclusive, partially exclusive, or nonexclusive. If your company is interested in these Thermal Insulation Test Apparatuses, or if you desire additional information, please reference Case Numbers KSC-12107, 12108, or 12390 and contact:

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