

Cryogenics Test Laboratory at NASA Kennedy Space Center

Thermal Insulation Systems Testing

<i>Instrument</i>	<i>Geometry</i>	<i>Type</i>	<i>Test Specimen Size</i>	<i>ASTM C1774</i>	<i>Environment</i>	<i>Heat Flux (W/m²)</i>
Cryostat-100	Cylindrical	Absolute	1-m long, 167-mm diameter, up to 50-mm thick	Annex A1	Full range vacuum 77 - 353 K	0.1-200
Cryostat-200	Cylindrical	Comparative	0.5-m long, 132-mm diameter, up to 50-mm thick	Annex A2	Full range vacuum 77 K - 353 K	1-200
Cryostat-500	Flat plate	Absolute	200-mm diameter, up to 40-mm thick	Annex A3	Full range vacuum 77 K - 353 K	0.4-400
Cryostat-600	Flat plate	Absolute w/ structural element opt.	300-mm diameter, up to any thickness	Annex A3	Full range vacuum 77 K - 353 K	0.4-400
Cryostat-400	Flat plate	Comparative	200-mm diameter, up to 40-mm thick	Annex A4	Full range vacuum 77 K - 353 K	4-400
Macroflash (Cup Cryostat)	Flat plate	Comparative	76-mm diameter, up to 7-mm thick	Annex A4	No Vacuum 77 K - 353 K	80-1,000
Cold Pipeline Test Apparatus	Horizontal	Absolute	12-m long, diameter from 25 to 88-mm	ASTM C335	No Vacuum (NV) or Vacuum-Jacket (VJ) 77 K - 353 K	4-400
Transient Thermal Tester (TTT)	Flat plate	Transient	76 or 200 mm diameter by up to 25-mm thickness	Lab standard	No Vacuum 373 K (Hot) or 77 K (Cold)	80-1,000
Cold Moisture Uptake (CMU)	Flat plate	Absolute	200-mm diameter, up to 40-mm thick	Lab standard	No Vacuum 77 K - 300 K / 35-95 %RH	4-400

Technical Notes:

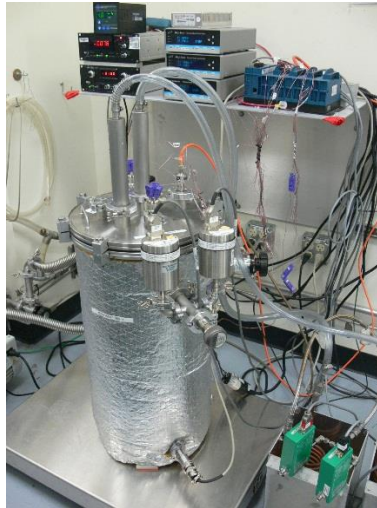
1. Measurement principle is steady-state boiloff calorimetry using liquid nitrogen as a direct energy meter.
2. Standard boundary temperatures are 78 K (cold) and 293 K (warm) but any combination of conditions between 78 K and 353 K is available. Heat flux ranges are approximate depending on temperatures, environment, material, and thickness.
3. Full range vacuum is from below 1×10^{-5} torr to 760 torr.
4. Residual gas environment is nitrogen (standard) or other gases such as helium, argon, or carbon dioxide as required.
5. Materials/systems tested: foams, powders, aerogels, blankets, multilayer insulation (MLI), composites, panels, plastics.

Commercial testing services are provided following standard laboratory procedures, ASTM C1774, and ASTM C740. The instruments listed are patented or patent-pending and available for licensing opportunities (<http://technology.ksc.nasa.gov/>).





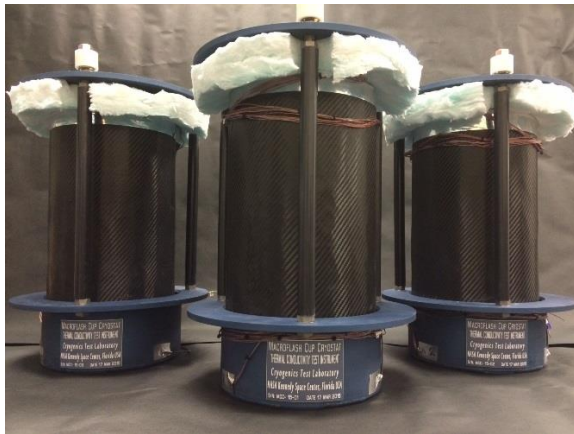
Cryostat-100



Cryostat-500



Cryostat-600



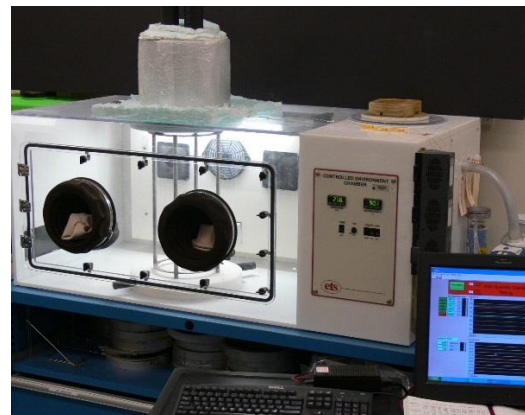
Macroflash (Cup Cryostat)



Transient Thermal Tester (TTT)



Cold Pipeline Test Apparatus



Cold Moisture Uptake (CMU)

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