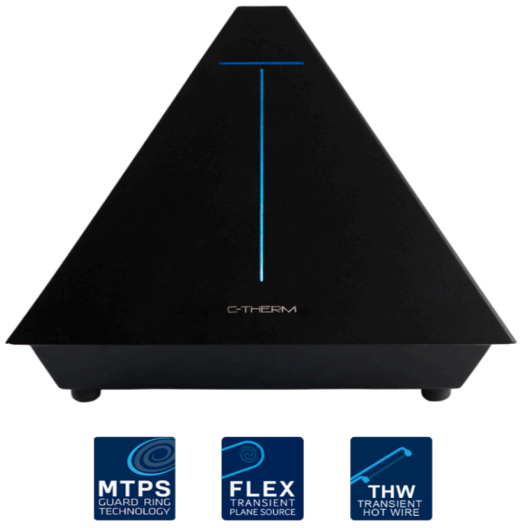
Why Thermal Conductivity Measurement Matters for TIMs

Thermal conductivity is a critical performance parameter for thermal interface materials (TIMs) used in electronics cooling, semiconductor packaging, battery systems, and high-power devices. TIMs reduce interfacial thermal resistance between components and heat sinks, improving efficiency, reliability, and device lifetime.

Accurate TIM characterization requires measurement techniques capable of evaluating soft, heterogeneous, and compressible materials, including thermal greases, gap fillers, phase change materials, adhesives, and thermally conductive pads. The C-Therm Trident and ZFW TIM-Tester enable rapid, reliable thermal conductivity testing to support TIM development, material selection, and quality control in advanced thermal management applications.

Thermal Conductivity Testing Instruments for TIMs



C-Therm Trident Thermal Conductivity Instrument

The C-Therm Trident Thermal Conductivity Instrument is engineered to characterize a wide range of thermal interface materials under conditions that reflect real-world device operation. It delivers fast, accurate, and repeatable thermal conductivity and impedance measurements for TIMs such as thermal greases, gap fillers, phase change materials, adhesives, and pads—supporting applications in electronics cooling, semiconductor packaging, battery systems, and high-power device thermal management.

Test a Variety of Form Factors

Measure cured and uncured materials, anisotropic samples, thin films, cooling liquids, pastes, pads, greases, adhesives, and samples of limited volume.

Representative Test Conditions

Test materials under compression and other application conditions including temperature, pressure, humidity, thermal cycling, and aging.

Accelerated Time to Market

Facilitate down selection of materials by quickly comparing TIM formulations and identifying filler dispersion, sedimentation, and agglomeration issues earlier in development.

Standards-Ready Data

Generate reliable data and validate technical data sheets conforming to industry standards ISO 22007-2, ISO 22007-7, ASTM D7896, and ASTM E3088.

Which TIM Format Are You Characterizing?

Thermal Pastes & Greases

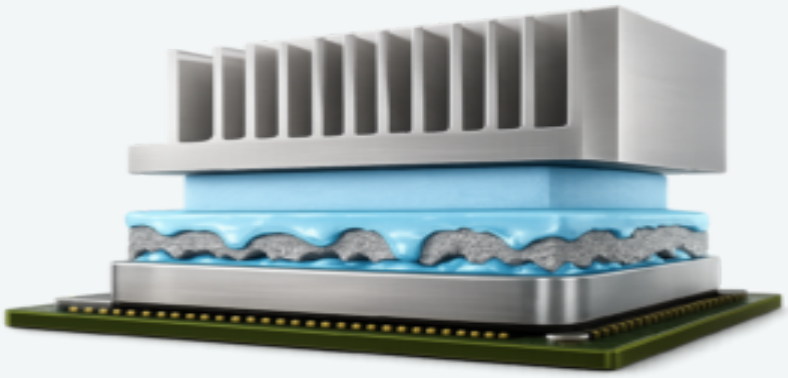
Thermal pastes and greases fill microscopic surface irregularities between a component and heat sink — and thermal conductivity is the key performance metric. C-Therm's Modified Transient Plane Source (MTPS) method, following ASTM D7984, tests pastes and greases directly in their as-applied state: no sample preparation, no moulding, results in under 3 seconds. The single-sided sensor accommodates liquid, semi-liquid, and paste-format TIMs across -50°C to 200°C, supporting both R&D formulation screening and incoming QC workflows. When compression matters, the MTPS pairs with C-Therm's Compression Test Accessory (CTA) to capture conductivity under

controlled loads — delivering representative data where grease spreads under clamping pressure.

Conductive paste being applied to heat sink

Phase Change Materials

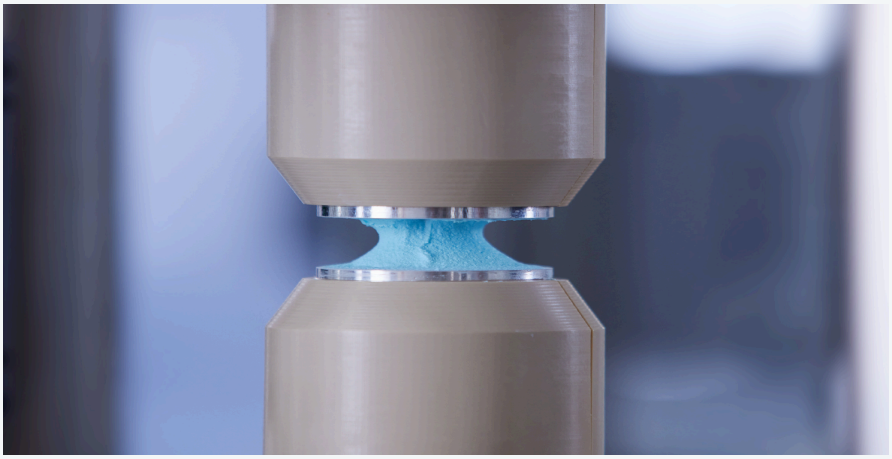
Phase change materials liquefy at operating temperature, conforming to surfaces and eliminating contact resistance — but this dual-state behavior requires thermal characterization in both solid and liquid phases. C-Therm's MTPS method measures thermal conductivity from -50°C to 200°C without changing sensors or sample holders, capturing PCM performance above and below the phase transition in a single test run. For cryogenic or high-temperature specialty compounds, the Flex Transient Plane Source (TPS) extends the range to -200°C to +600°C under ISO 22007-2. Both methods use a single sensor contact, supporting formulation development, datasheet verification, and phase-transition characterization for polymer- and metal-based PCMs.



Phase Change TIM

Gap Pads & Gap Fillers

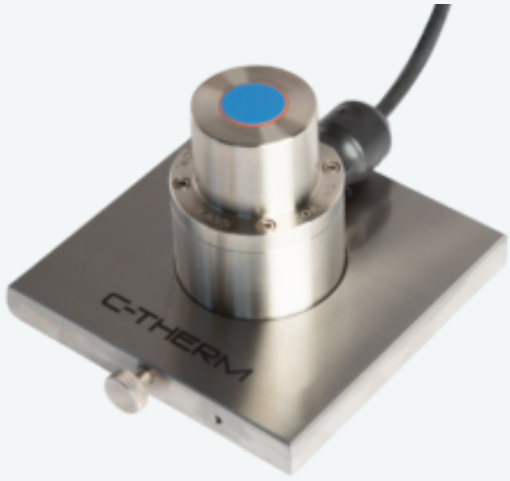
Gap pads and fillers are among the most compression-sensitive TIM formats: thermal resistance shifts measurably with bondline thickness. The ZFW TIM-Tester follows ASTM D5470, measuring thermal resistance and conductivity under precisely controlled compression loads up to 2 N/mm², with 0.1 µm optical gap resolution. Reproducibility is better than 1 mm²K/W — the tightest specification commercially available. Unlike methods that apply fixed or uncontrolled contact pressure, the ZFW TIM-Tester replicates real-world assembly conditions across the full compression range, giving design engineers the compression-dependent k curves needed to validate gap pad selection before production.



Gap filler on TIM-Tester

Potting Compounds & Adhesives

Potting compounds and adhesives protect electronics while dissipating heat — thermal performance depends critically on filler loading and dispersion uniformity. The MTPS 18 mm sensor maps conductivity across a sample surface, detecting dispersion gradients and hot-spot risk before parts leave the production line. Testing is possible in both uncured and fully cured states, giving formulators comparable data at every development stage. For highly filled systems, material density (ρ) and heat capacity (Cp) can be manually entered to refine the MTPS calibration — analogous to ASTM E1461 Laser Flash — ensuring accurate measurement at filler loadings that push conductivity above 10 W/mK.



Trident MTPS sensor