HUMAN HEALTH

ENVIRONMENTAL HEALTH

WHEN FAILURE IS NOT AN OPTION

TMA 4000

PerkinElmer®

For the Better

IT'S CONFIDENCE YOU CAN MEASURE

A main source of mechanical stress – and failure – in electronics components (and other products as well) is thermal expansion. Determining the precise glass-transition temperature where materials begin to soften and stress relief effects can begin to occur, or the point at which delamination can happen, are critical factors affecting the performance of electronics. And they're just as critical for the *financial* performance of the companies that manufacture them.

Enter the PerkinElmer TMA 4000, the simple, easy-to-use, rugged thermomechanical analysis system that's ideal for measuring expansion of small components and low expansion rates – circuit boards, component materials, and so much more. And in these times of budgetary constraints and increasing regulatory requirements – RoHS, ASTM, and ISO included – it's the cost-effective TMA that makes everyone in your lab an expert.

Turn up the heat on TMA

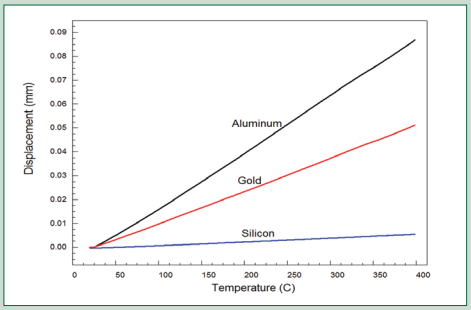
The TMA 4000 is a perfect solution for determining coefficients of expansion – accurately and efficiently, time after time. Start with its rugged, all-metal furnace, designed to deliver thousands of hours of safe, failure-free operation at temperatures ranging from -80 °C to 800 °C. And its height-to-width aspect ratio enables accurate measurements of any size sample – from a few microns to a centimeter tall or more.

Plus, the motorized furnace lift provides smooth, precise furnace repositioning after loading, and it's linked with position sensors to ensure safe operation according to laboratory SOPs.

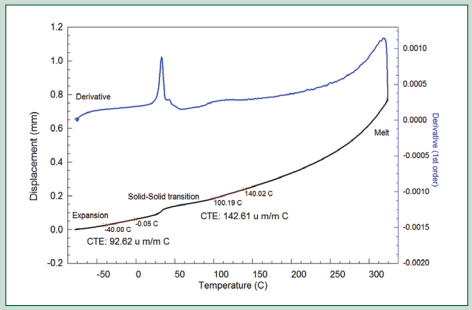
Simple and direct

While most TMAs market their U-shaped geometry as a convenience feature, this can result in friction in the system, uneven force application, noise – and sample deformation. Our direct, inline system provides the lowest friction – and better results.

What TMA Can Do for You



Mismatches in the coefficient of thermal expansion (CTE) can lead to early failures – from motors freezing to food packing ruptures to bad solders on microchips. These CTE curves show three pure metals with very different expansion rates as a function of temperature.



Worth it's weight in gold

When a sample is softening, you want to control the force that comes in contact with it. Even noise from the force motor can result in penetration into or deformation of the sample. That's the beauty of our Archimedean float suspension – a feature unique to the TMA 4000. The float suspension fully supports the weight of the probe and force coil, so you apply just the amount of force required. Plus, it acts to dampen any vibration in the environment – and your sample.

What's more, interchangeable probe types allow you to switch quickly between expansion, flexure, and various penetration probes – all of which can be used with industry-standard test methods. An extension accessory includes a tool for convenient mounting of delicate films and fibers, too.

Core rod and probe are fully supported by our unique Archimedian float suspension.

Calibration couldn't be easier

The TMA 4000 is fully computerized with most functions under keyboard control. The temperature sensor is precalibrated to give a precise temperature readout, while calibrations to improve accuracy under difficult sampling or fast-scanning conditions are simple to follow. Plus, you get software-enabled realtime data display; automatic zero and reading of sample height; curve optimization, comparison, and calculation; program archiving; and much, much more.

TMA 4000: simple, sensitive, rugged, reliable

The TMA 4000 is an outstanding solution for labs needing to inexpensively meet regulatory requirements for thermal expansion in the electronics and other sensitive industries.

Here are just a few ways the system is optimized for thermal analysis:

- The cold sink's surface is cooled by a heat exchanger that allows a chiller to be attached – by a single bolt.
- Its furnace is 40 mm high, providing an extremely wide uniform temperature zone.
- Its linear variable differential transformer (LVDT) position sensor provides sensitivity to small changes and the ability to track large-dimensional changes.
- The wholly submerged Archimedean float supports the weight of the sample probe and core rod, plus dampens noise – all while protecting your quartz ware.

We know thermal analysis like nobody else

Best of all, the TMA 4000 fills an important slot in our complete range of rugged, highly reliable thermal analysis products, parts, and consumables. Plus, our OneSource® Laboratory Services comprises the most comprehensive portfolio of professional laboratory support offerings in the business, including complete care programs for nearly any technology and manufacturer.

THE EXPANDING (AND CONTRACTING) CASE FOR TMA

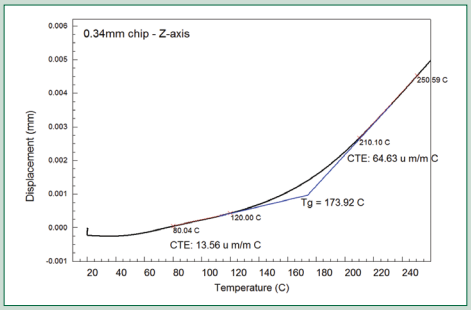
Because expansion and glass transition (softening) are fundamental properties of materials, TMA is critical to a wide range of industries and products.

In the **electronics** industry, mismatched thermal expansion can cause failures of laminated board, encapsulated chips, packing, and soldered parts. Too low a softening point can cause material failures when operating temperatures get high.

In **food** and **food packaging**, thermal size changes with temperature affect laminated films, seals, and material volumes. Mouth feel is strongly related to softening points occurring at certain temperatures. Changes in temperature also mean changes in the volume of products enclosed.

In industries like **polymers**, **automotive**, and **pipelines**, expansion and contraction due to heating or cooling can affect whether motors bind, s eals leak, or gaskets fail. Welds in materials like Invar® must be checked to see if welding alters the expansion of the metal.

TMA is sensitive to transitions in materials as these cause changes in thermal expansion. TMA can detect very weak transitions that would not be visible in DSC or DTA, such as the solid-solid transition in polytetrafluoroethylene (PTFE) at around 20 °C.



Electronic device manufacturers and designers are concerned about the thermal expansion of their materials, as well as softening points and glass transitions. Industry-standard test methods require measurement of all these factors, as shown in this example of a chip run in the z direction.

PerkinElmer, Inc.
940 Winter Street
Waltham, MA 02451 USA
P: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

For a complete listing of our global offices, visit www.perkinelmer.com/ContactUs

011115A_01