



Description

TIMA is a fully ASTM D 5470 compliant measurement system for thermal characterization of thermal interface material and other material with low to mid-ranged thermal conductivity.

Technical Specification

System

System type	Benchtop material characterization system	
Footprint (w × d)	35 × 40	cm ²
Height	75	cm
Weight	50	kg
Power supply	100 ... 230	VAC
	50 ... 60	Hz
	600	W

Measurement

Measurement type	Thermal steady-state characterization	
Applied standards	ASTM D 5470-17	
Output	Thermal resistance	mm ² K/W
	Thermal conductivity	W/(m·K)
	Thermal interface resistance	mm ² K/W
Resolution	1.0	mm ² K/W

Sample properties

	min	max	
Sample size (round, diameter)	10	25.4	mm
Sample size (square, edge length)	10	25.4	mm
Sample thickness	< 0.001	10.0	mm

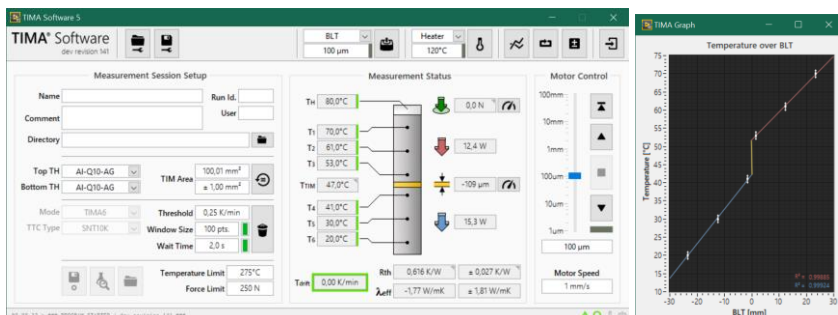
Measurement conditions

Force (continuous)	-300 ... 300		
Force (short-term)	-450 ... 450		N
Pressure (short-term)		Ø 10 mm	5.7 MPa
			850 Psi
		Ø 25.4 mm	0.9 MPa
			130 Psi
Sample Temperature	20 ... 150		°C

Measurement accuracy

Sensor temperatures	± 0.2		K
Sample temperature	± 0.05		K
Sample thickness	load-free	± 1*	µm
	force load of x N	± 2 * 0.02x	µm
Mechanical load	± 1		N
Thermal resistance	< ± 5		%

Software screenshots



Key features

- » Full ASTM D 5470 compliance
- » Compact and all-in-one
- » Automated & scheduled testing
- » Swiftly exchangeable test heads
- » High precision thickness monitoring
- » Ease of use, optimized for user experience

Key output material and compound properties

- » Thermal resistance
- » Bulk thermal conductivity
- » Thermal interface resistance

Key testing schemes

- » Temperature dependency
- » Pressure dependency
- » Thermal performance
- » Interface quality
- » Thermo-mechanical stability
- » Aging behavior / life expectation

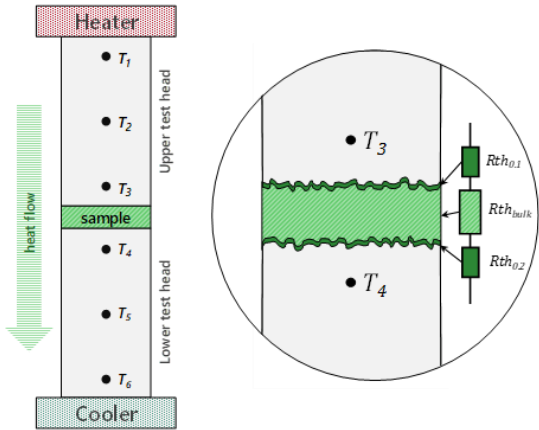
Scope of samples

- » Thermal interface material
- » Pastes and greases
- » Gap pads and gap filler
- » Foils and sheets
- » Adhesive and cured material
- » Mold compound
- » Underfiller
- » Substrates and interposer

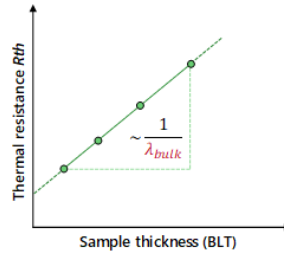
The principle of ASTM D 5470

Samples are measured between two metal test heads that are known in geometry and physical properties. Measuring both temperature gradient ΔT over and heat flow Q through the sample returns its effective thermal resistance $R_{th,eff}$.

Repeating such measurement for multiple sample thicknesses allows to calculate the following linear fit to receive the sample's bulk thermal conductivity.



Linear fit of R_{th} over BLT



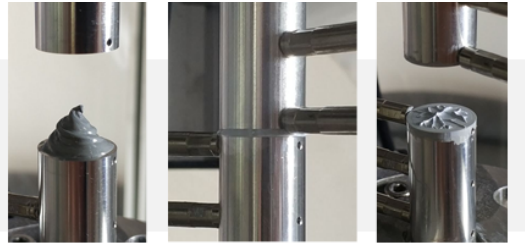
$$R_{th,eff} = R_{th,bulk} + R_{th0}$$

$$R_{th,eff} = \frac{\Delta T}{Q}$$

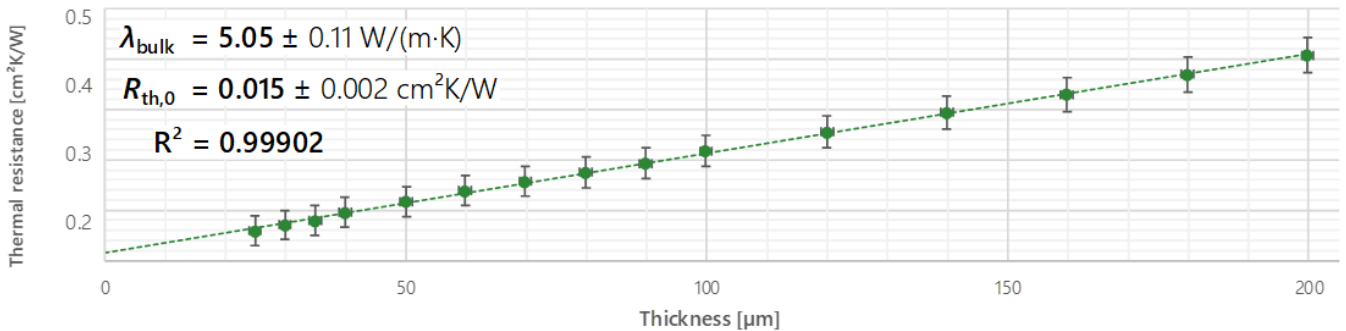
$$R_{th,eff} = \frac{1}{\lambda_{bulk} \cdot A} \cdot BLT + R_{th0}$$

The linear fit over the thickness bears information about **bulk thermal conductivity** and **thermal interface resistance**.

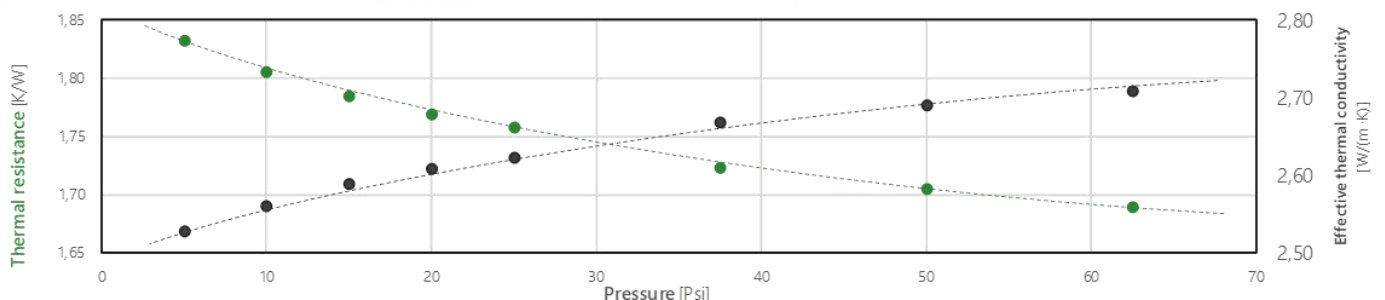
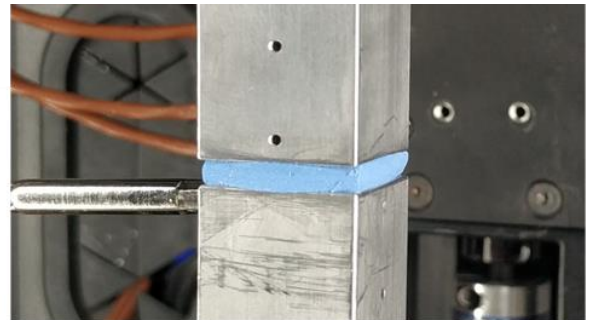
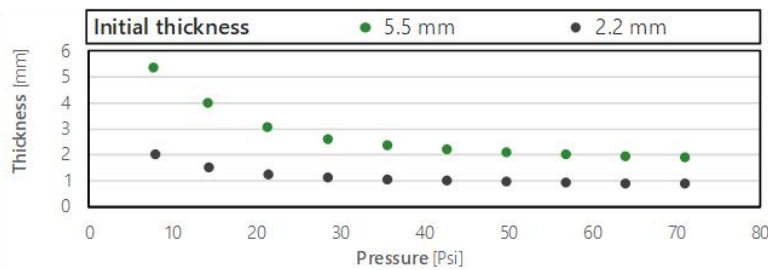
Determination of bulk thermal conductivity



- » Eff. thermal resistance over bond line thickness
→ Bulk thermal conductivity and contact resistance
- » Thickness range 25 to 200 μm
- » 60°C sample temperature



Thermal characterization of soft material



Measurement deviation

$R_{th} = \Delta T / Q$		Q [W]	5	10	15	20	25	30	40	50
ΔT [K]	$d\Delta T$	dQ	5.0%	3.9%	3.6%	3.5%	3.4%	3.3%	3.3%	3.3%
		dR _{th}								
1	10.5%		15.5%	14.4%	14.1%	14.0%	13.9%	13.8%	13.8%	13.8%
2	5.5%		10.5%	9.4%	9.1%	9.0%	8.9%	8.8%	8.8%	8.8%
5	2.5%		7.5%	6.4%	6.1%	6.0%	5.9%	5.8%	5.8%	5.8%
10	1.5%		6.5%	5.4%	5.1%	5.0%	4.9%	4.8%	4.8%	4.8%
15	1.2%		6.2%	5.1%	4.8%	4.7%	4.6%	4.5%	4.5%	4.5%
20	1.0%		6.0%	4.9%	4.6%	4.5%	4.4%	4.3%	4.3%	4.3%
25	0.9%		5.9%	4.8%	4.5%	4.4%	4.3%	4.2%	4.2%	4.2%
30	0.8%		5.8%	4.7%	4.4%	4.3%	4.2%	4.1%	4.1%	4.1%
40	0.8%		5.8%	4.7%	4.4%	4.3%	4.2%	4.1%	4.1%	4.1%
50	0.7%		5.7%	4.6%	4.3%	4.2%	4.1%	4.0%	4.0%	4.0%
60	0.7%		5.7%	4.6%	4.3%	4.2%	4.1%	4.0%	4.0%	4.0%
70	0.7%		5.7%	4.6%	4.3%	4.2%	4.1%	4.0%	4.0%	4.0%
90	0.6%		5.6%	4.5%	4.2%	4.1%	4.0%	3.9%	3.9%	3.9%
100	0.6%		5.6%	4.5%	4.2%	4.1%	4.0%	3.9%	3.9%	3.9%

