

Thermal Interface Material Tester (TIM Tester)

The Analysis Tech Thermal Interface Material Tester, "TIM Tester 1300/1400", measures bulk thermal conductivity in materials having moderate-to-high thermal conductivity and is ideally suited for measurement of thermal interface materials used in electronic packaging.

The TIM Tester 1300/1400 conforms to test method **ASTM D-5470** but also utilizes thermal structure analysis to enhance the speed and accuracy of the measurement.



Thermal Interface Material Tester Features

- Fully automatic operation under WinTIM Software
- Selectable "fixed-parallel" or "floating non-parallel" test surfaces
- Thickness measurement of sample "as-tested" / "in-situ"
- Selectable sample-temperature controls and sequential batch mode
- Automatic pressure control and sequential batch mode
- User selectable test unit selection:
 - English: watt, K, inch, psi
 - Metric: watt, K, cm, kilopascal
- Continuous Fail-safe Error Detection:
 - Low coolant flow
 - Low air pressure supply
 - Over-temperature
- Operator mechanical press-safety
- Convenient USB interface to PC computer
- Sturdy, heavy-duty construction
- In-house calibration procedures

TIM Tester requires a recirculating chiller for water-coolant flow, compressed "shop" air, and a Pentium-based PC computer running the Windows XP operating system.

Test control and data collection are performed by the (included) WinTIM software using a USB port connection to the TIM Tester. Both the coolant and compressed air are provided with quick disconnects for convenience.

AC power is normally 120VAC, 60 Hz unless otherwise specified.



All test parameters and measurement procedures are under automated software control using a convenient graphical-user-interface. Contact pressure and all aspects of specimen temperature and heating power are automatically controlled for the ultimate in operator convenience. Test data is presented simply and clearly with convenient thermal data plotting versus thickness or pressure. Plotting techniques facilitate the determination of surface-contact thermal resistances. Sample thickness is measured **during** testing which is commonly known as "in situ thickness measurement". Alternatively, the user can enter pretest measured or nominal sample thickness. In "automatic duration control mode" the software will dynamically finish a test when sufficient testing time has elapsed. Alternatively, the user can select "fixed duration" testing that will maintain steady-state testing for the specified duration.

The capability to convenient in-house instrument calibrations has been designed into the TIM Tester 1300/1400 both in hardware and software. Operation of the TIM tester requires a source of temperature-controlled cooling water, and a source of compressed "shop" air @ 100 psi (700 kPa).

TIM Tester Accessories:

■TIM Turnkey Accessory Package:

- Re-circulating precision-temperature chiller with serial control module and cables
- Calibration package: Tc Calibrator and TIM calibrator unit
- Coolant hoses with drip-less quick connectors
- Compressed air tubing and air filter
- Note: package does not include PC computer
- Options for "fluidic/semi-liquid" samples
- PC Computer

TIM Tester 1300 Specifications

Sample Size	Diameter: 1.0" - 1.3" (25 - 33 mm) Thickness: 0.0" - 1.0" (0 - 25mm)
Sample Resistance Range	0.05 °C/W - 5.0 °C/W
Sample Temperature Range	10 °C - 75 °C +/- 2°C
Contact Pressure Range	Model 1300A: 10 – 75 psi (70 – 560 kPa) Model 1300B: 20 – 385 psi (140 – 2700 kPa) Model 1300C: 40 – 550 psi (280 – 3800 kPa)
Contact Pressure Accuracy	+/- 1.5% full span
In-Situ Sample Thickness Measurement	0.0" - 0.125" (0.0 - 3.2 mm) Extended: 0.100" - 0.500" (2.5 - 7.5 mm)
In-Situ Sample Thickness Measurement Accuracy	Typical: +/- 0.001" (0.025 mm) Maximum: +/- 0.002" (0.050 mm) Extended: +/- 0.003" (0.075 mm)
Supply Voltage	100/115/220/230 VAC 50/60 Hz 115 VAC, 60 Hz standard
Dimensions (including test stage)	22.5" H x 16.5" W x 17" D
Coolant Supply Requirements	Flow Rate: 1.5 gal/min (6 liter/min) Pressure Limit: 20 psi (140 kPa) Temperature Control: +/- .2°C max.
Compressed Air Supply	Pressure Minimum: 100 psi (700 kPa) Particulate Filtration: 5 micron
Weight	50 lbs (23 kg)
Shipping Weight	85 lbs (39 kg)

Ordering Information

Order numbers: Model 1300A, Model 1300B, Model 1300C. Standard delivery: 5 weeks. Ex Works Specify AC Line voltage. Custom orders welcome.

TIM Tester 1400 Preliminary Specifications

Sample Size	Diameter: 0.9" - 1.3" (22 - 33 mm) Thickness: 0.0" - 0.8 " (0 - 20mm)
Sample Resistance Range	0.005 K/W - 10 K/W
Sample Temperature Range (max.)	15°C - 140 °C (approx.)
Contact Pressure Range	Kit 1: 5 – 95 psi (50 – 650 kPa) Kit 2: 10–170 psi (100–1100 kPa) Kit 3: 20–380 psi (100–2600 kPa) Kit 4 Option: Complete Kits 1, 2, & 3
Contact Pressure Accuracy	Kit 1: +/- 2.5 psi (2 kPa) Kit 2: +/- 5 psi (4 kPa) Kit 3: +/- 10 psi (7 kPa) (see note below)
Sample Thickness Electronic-Measurement Range	0.00" - 0.35" (0 - 9 mm) (other ranges available)
Sample Thickness Electronic-Measurement Accuracy	+/- 3% of thickness reading minimum: +/- 0.001 (25 micron) (typical tolerance in hi-accuracy mode)
Supply Voltage	100/115/220/230 VAC 50/60 Hz (115 VAC, 60 Hz standard)
Dimensions (including test stage)	22.5" H x 16.5" W x 17" D
Coolant Supply Requirements	Flow Rate: 1.5 gal/min (6 liter/min) Pressure Limit: 40 psi (280 kPa) Temperature Control: +/- .1°C Set Point Range: 10°C - 35°C, minimum Cooling Capacity: 900 watts, minimum
Compressed Air Supply	Pressure Minimum: 90 psi (700 kPa) Particulate Filtration: 10 micron
Weight	70 lbs (32 kg)
Shipping Weight	100 lbs (45 kg)

Note: The accuracy of the contact pressure control is based on the maximum contact pressure of the kit utilized for the maximum sample-area. Although the accuracy of the commanded-to-actual pressures is about +/-2.7% for all kits, the *absolute* accuracy of the contact pressure achieved will depend on the pressure range kit installed: the smaller the full-span of the kit, the better the absolute accuracy. Changing kits requires a simple hardware change and software parameter selection.

Ordering Information

Order number: Model 1400-Kx where "x" is the desired kit number. Standard delivery: 5 weeks, Ex Works.
Optional: 3 complete kit sets for user-installation of desired pressure range kit; order "TIM 1400-K4"
Specify AC Line voltage if other than 120 VAC. Custom orders welcome.

TIM Accessory Package

Accessory Package for Turnkey Operation

The TIM Tester requires a number of external facilities for operation. These include temperature controlled coolant flow, filtered compressed air, calibration equipment (if in-house calibrations are desired), and a PC computer running Windows® XP. Although some users may choose to provide or acquire these items independently, a package of these accessories is offered to provide convenient turnkey operation. This package includes:

- Re-circulating, temperature-controlled chiller with serial communication control
- Coolant hoses with drip-free quick-connects and 2 meter hose set
- Calibration hardware including TIM Calibrator and Thermocouple Calibrator
- Compressed air filter, fittings, and tubing
- **Optional:** PC computer w/ LCD monitor

The re-circulating chiller provides precision temperature-control at sufficient flow rate and pressure for peak performance of the TIM Tester. The computer/chiller serial communication link allows WinTIM to control the sample temperature for ASTM D5470 compliance. The flexible coolant hoses with double ended "drip-free" quick-connects can be connected and disconnected quickly and conveniently.

The recommended bi-annual instrument calibration can be conveniently be performed "in-lab" without ever removing the TIM Tester from the lab using the TIM Calibrator and TC Calibrator. The TIM Calibrator is a unique unit that connects to the rear panel of the TIM Tester and provides calibration signals that can be measured with a calibrated lab-voltmeter (not included) in conjunction with WinTIM Software. The TC Calibrator provides automatic calibration of the TIM thermocouple ports in conjunction with WinTIM Software.

The accessory package includes a compressed air filter with a selection of quick-connect air fittings and flexible air tubing for connection of the TIM Tester to the facility compressed air supply. The compressed air provided to the TIM Tester must be filtered to within 5 microns. The use of the laboratory compressed air supply that is not sufficiently free from dust and particulates may cause failure of the TIM Tester internal pressure regulator. The filter included in the Accessory Package provides necessary filtering to ensure long-term reliability.

Recirculating Chiller Requirements

The TIM Testers require a recirculating chiller for coolant flow with sufficient temperature stability and flow rate for optimal test results.

Recommended Chiller Specifications

- Flow Rate: 2.0 gal/min (8 liter/min) positive displacement pump
- Pressure Limit: 50 psi (280 kPa)
- Temperature Control Stability: +/- 0.1°C @ min. 500W (TIM 1300) or min. 900W (TIM 1400)
- Set Point Range (minimum): 10°C - 35°C

Any chiller that fits these technical requirements *can* be used although a chiller that is controllable via serial communication port is most convenient. WinTIM software uses the serial control link to turn the chiller ON/OFF and to change the chiller setpoints. When using a chiller that is not equipped with serial control capability, WinTIM displays screen-prompts for the operator to perform these ON/OFF and setpoint changes manually. Version 5.0 WinTIM minimizes the need for chiller setpoint changes when testing to the ASTM 5470 sample average-temperature of 50°C. This means that for samples with impedances greater than 0.16 K in²/W (1.0 K cm²/W), almost no chiller setpoint changes are required.

If the ultimate in convenience is required, WinTIM software exclusively supports Thermo-Fischer chillers with serial control commands that are embedded in WinTIM software. The following chillers all provide the above performance specifications and built-in serial control capabilities:

Thermo-Fischer Scientific Chillers

- 100VAC, 60 H ThermoFlex900 PD1 100/60 RS232 IPR
- 120VAC, 60 Hz ThermoFlex900 PD1 115/60 RS232 IPR
- 230VAC, 50 Hz ThermoFlex900 PD1 230/50 RS232 IPR
- 230VAC, 60 Hz ThermoFlex900 PD1 230/60 RS232 IPR
- 120VAC, 60 Hz M25 STD 115V PD1 RS232 # 262112032000
- 230VAC, 60 Hz M25 STD 230V PD1 RS232 # 262125032000

TIM Tester Calibration & Accessory Package: Calibration Instruments & Reference Sample Set

TIM Tester instrument calibrations can be conveniently performed "in-lab" without ever moving the unit. The TIM Calibrator and TC Calibrator accessories are provided for this purpose. The entire bi-annual calibration of the TIM Tester is a user-friendly, 10 minute procedure handled by WinTIM Software. During calibration, the TIM Calibrator is connected to the rear panel of the TIM Tester and provides calibration signals which can be measured with a calibrated lab-voltmeter (not included). The TC Calibrator provides automatic calibration of the TIM thermocouple ports in conjunction with WinTIM cal-routines and a USB communication link. WinTIM also provides complete help files and on-screen instructions for all aspects of instrument calibration. The Tc Calibrator and TIM Calibrator should be sent for yearly calibration and re-certification to Analysis Tech

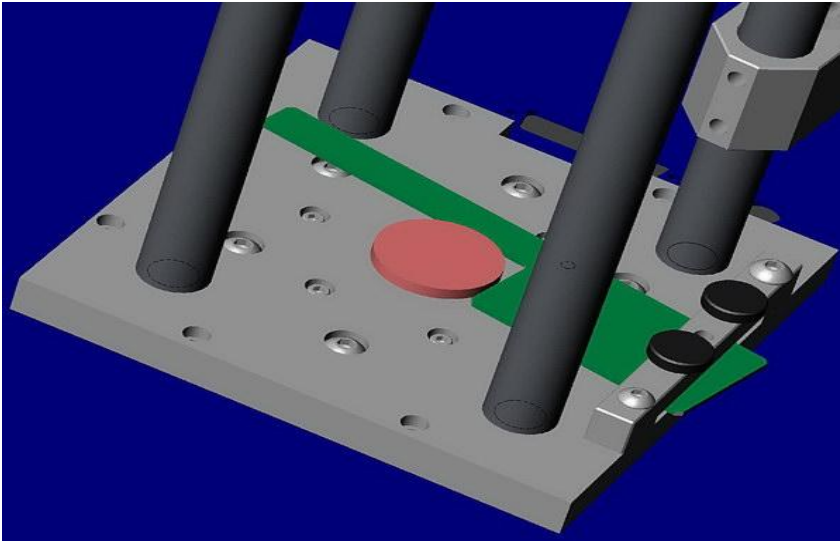


The Reference Sample Set provides a collection of prepared, pre-tested reference samples spanning the appropriate range of thermal impedances. These reference samples can be tested at any time to confirm the accuracy and consistency of the TIM Tester operation. Reference samples are tagged with the sample's impedance, tolerance, and specified test pressure. Type III (rigid) samples are carefully honed for minimal contact resistance. The included documentation provides certified traceability to national laboratory standards. Reference standard samples provide an excellent and convenient means to maintain highest verification and confidence in the TIM Test results.

This package also includes the [Sample Positioning Fixture](#).

TIM Tester Positioning Fixture: Convenient and Precise Sample Positioning

Sample testing with the Analysis Tech TIM Testers requires careful positioning of the test sample to achieve the highest level of repeatability. This is particularly true for type III samples (incompressible samples). Even the most consistent and diligent operators can experience up to 5% variations in the measured data due to subtle sample-positioning variations between tests. Such variations can be even larger when more than one operator is involved. This positioning fixture eliminates sample-position variation by providing a firm "corner" into which the test sample disks can be located with ease, consistently, each an every test. .



This fixture also eliminates the problem of type III samples *migrating* with the application of the contact pressure when oil or grease is used for surface-contact-resistance abatement.

TIM Tester Precision Test Disks: Sacrificial Copper Disks for Testing Adhesive Materials

When testing adhesive materials, replaceable disks are often used to avoid adhesive damage to the test surfaces of the TIM Tester. Typically the adhesive material is sandwiched and cured between two highly conductive metal disks that can be discarded after the test. These precision disks are carefully machined for flatness and thickness-uniformity to provide an ideal test vehicle for adhesive materials.

These disks are fabricated from machineable high conductivity copper. They are mirror-finished on one side to provide low contact resistance to the TIM Tester test surfaces. The disks are 0.125" (3.18 mm) thick to reduce the chance of warping or curvature in routine handling.

The disk diameter is 1.3" (33 mm) to exactly match the ideal sample diameter for the TIM Tester 1300. The fabrication of suitable test disks can be a significant challenge that is conveniently resolved with these precision test disks.

