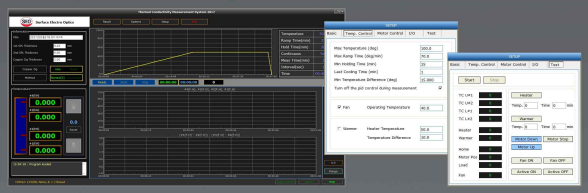
Time temperature & Measuring schedule



Specifications

Model	TCD - 100 V	TCD- 100 H
Standard Test Method	ASTM D 5470 /Heat Flow meter	Ångström method
Thermal conductivity range	0.1~360 w/m K	0.1~1,000 w/m K
Thermal Resistance range	0.05 ~ 5.0 °C/w	Thermal Diffusivity Min. 0.02m2 / sec
Temperature range	40 °C to 100 °C	25 °C to 70 °C
Temperature resolution	+/- 0.001 °C	
Accuracy	±3% reading value per reference	±3% reading value per reference
Applicable sample size (Thickness)	0.02 ~ 10mm (t)	
Applicable sample size (Circle, Square)	25mm circle or 22mm x 22mm square	Length : 52mm / Width : 15mm
Pressure range	10~75psi (70~560kpa)	10~75psi (70~560kpa)
Coolant system	Peltier System / Built-in Peltier	Peltier System / Built-in Peltier
	system (No need coolant ,circulator)	system (No need coolant ,circulator)
Thermocouple type	Constant heater wire &	Constant heater wire &
	RTD sensor	RTD sensor
Sample Capability	Solids, Thin Film, Polymers, Metal	Solids, Thin Film, Polymers, Metal
External output	USB channels / Thermocouple	USB channels / Thermocouple
Dimension (mm)	300(W) X 360(D) X 620(H)	300(W) X 360(D) X 620(H)
Weight (kg)	22Kg	22Kg
Electric Power source	110V / 220V, 50 / 60Hz, 100W	110V / 220V, 50 / 60Hz, 100W
Optional	Horizontal type (Ångström method)	Vertical type (ASTM D5470)
	Additional Board / software	Additional Board / software

Surface Electro Optics

#946, Kosekdong, Suwon City, Kyunggido,
441-813, Korea
Tel : +82.31.298.9561
Fax : +82.31.298.9565
E-mail : seo@s-eo.com

www.s-eo.com

America
FMX,inc.
Tel : + 858 922 6213
Fax : + 858 578 2230
E-mail : ysformanex@yahoo.com

China
SEO China
Tel : +86 21 62900232
Fax : + 86 21 62903552
E-mail : namza40@naver.com

Singapore
DNIV
Tel : +65 64833386
Fax : +65 64832998
E-mail : sales@dniv.com.sg
Web : http://www.dniv.com.sg

India
Elico Marketing PVT Ltd
Tel : +91 40 2315 3322
Fax : + 91 40 2315 7722
E-mail : info@elicomarketing.com
Web : http://www.elicomarketing.com

Malaysia
LabAlliance Sdn Bhd
Tel : +603 51226922
Fax : +603 51226912
E-mail : info@laballiance.com.my
Web : http://www.laballiance.com.my

Japan
Meiwafosis Co., Ltd
Tel : +81 6 6674 2222
Fax : + 81 6 6674 2323
E-mail : inuzuka@meiwanet.co.jp
Web : http://www.meiwafosis.com

Taiwan
AMI
Tel : +886 4 2237 7177
Fax : +886 4 2237 7181
E-mail : sales@amtech.com.tw
Web : http://www.amtech.com.tw

Brazil
Precilabo Instrumental Ltda.
Tel : +55 (11) 4786 2177 / 4771 6954
Cel : +55 (11) 9625 8550
E-mail : hans@resterm.com.br
Web : http://www.resterm.com.br

Turkey
Teknotip Analitik Sistemler Ltd
Tel : +90 312 236 42 07-08
Fax : +90 312 236 42 18
E-mail : teknotip@teknotip.com.tr
Web : http://www.teknotip.com.tr

Europe
THASS
Pfingstweide 21 61169 Friedberg-Germany
Tel : +49 6031 16223 21
Fax : +49 6031 16223 29
E-mail : j.koch@thass.net
Web : http://www.thass.net

Total Solution Surface Chemistry

Thermal Conductivity

Surface Electro Optics
Excellence in Surface Chemistry Analysis

Thermal Conductivity INTRODUCTION

There are a number of possible ways to measure thermal conductivity, each of them suitable for a limited range of materials, depending on the thermal properties and the medium temperature. ASTM D 5470 describes a standard method of determining the thermal conductivity of a thin solid thermally conductive material. The thermal conductivity (λ) is defined as the time rate of heat flow, under steady conditions, through unit area, per unit temperature gradient in the direction perpendicular to the area

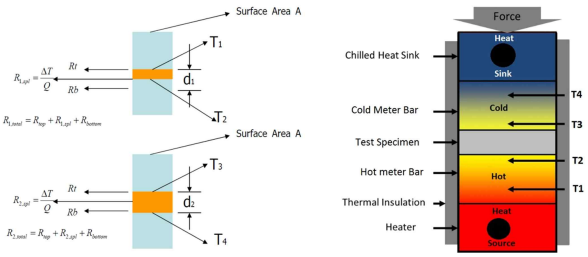
$$Q = \frac{K A}{d_A}\Delta T$$

Where Q = Heat flow
A = Area of reference
K = thermal conductivity
$\Delta T = (T_1 - T_2)$ distance between temperature sensor in the meter bars
d_A = themperature difference between temperature sensor of the meter bars

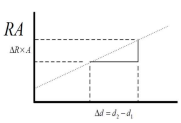
Thermal conductivity -Vertical Bartype

Many methods have been developed for measuring thermal conductivity accurately.
Static methods involve measurements of the temperature gradient in conduction with the heatflux.
Dynamic methods are typically more effective at room temperature, heat losse shaving a smaller effect on the measurement.

Measurement of the thermal conductivity the D5470 involves measuring the temperature difference at the two interface surfaces with a known steady heat flow through a known area with known increasing thickness of material.



The inverse of the slope of the line produced by plotting thermal resistance vs. thickness is the conductivity. The thermal resistance at zero thickness is the interface resistance. When using this technique to measure phase change materials, it is important to use compression stops equal to the thickness of material being tested. It is also necessary to insure that the data is taken above the phase change temperature for the material under test.



$$R = \frac{\Delta T}{Q}$$

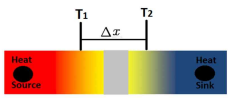
$$K = \frac{Q}{T_1 - T_2} \times \frac{d}{A} = \frac{1}{R} \times \frac{d}{A}$$

$$K = \frac{1}{slope} = \frac{\Delta d}{\Delta R A} = \frac{\Delta d}{(R_{1,sp} - R_{t,sp}) \times A}$$

Where K = thermal conductivity
R = thermal resistance

Thermal conductivity-Horizontal Bar type

This experiment is based on a dynamic method of measuring thermal conductivity of a metalrod developed by Ångström in 1863. Heat is applied periodically to one end of a metal rod while the other end is left at the temperature of the surrounding medium. A heat wave propagates down the length of the rod, both losing amplitude and experiencing a phase shift. The fluctuations in temperature as a function of time are measured by two thermistors along therod, and a comparison of the temperature wave sleads to a determination of the thermal conductivity value for the metal.



$$K = c\rho\alpha$$

where K thermal conductivity ($W/m \cdot K$)
c specific heat
α thermal diffusivity
ρ density (kg/m^3)

$$\alpha = \frac{(\Delta x)^2}{2\Delta t \ln(\frac{T_1}{T_2})}$$

Thermal Conductivity INSTRUMENT

The SEO TCD-100 Thermal conductivity system is based on idealized heat conduction between two parallel, isothermal surface separated by a test specimen of uniform thickness. ASTM Standard D5470 is intended to standardize the method for thermal conductivity measurement so that the results will reflect only the material properties without regard to the specific test equipment utilized. Thermal conductivity is a fundamental material property that is essential for characterizing conduction heat transfer.

The SEO TCD-100 is factory calibrated using specimens of known thermal resistance spanning the range of the instrument.
The system does quick and easy simple operation, small sample size ,and short cycle time ,the TCD-100 is ideally suited for QC ,R&D and screening of all kinds and types of sample materials.The thermal conductivity of samples is calculated basedon the change of the thermal resistance of the TCD-100 as a function of its thickness.This system resembles the ASTM D5470 reference, however the measurement of thetemperature control is carried out at Peltierunit in the top. This fine temperature measurement and the calculation of the applied power based on accurate electrical parameters is responsible for the high repeatability of the testing solution.

Then, measurements for thermal conductivity were performed on the following samples; Homogeneous material in film, sheet or thin board form, of those sample like Metals, rubber, plastics,ceramics, paper, textile or wood.

Feature;

- Fully automatic operation by Quantum-E Software
- Automatic pressure control by Quantum-E Software
- High performance temperature controller Built-in coolant system (No need the coolant unit)
- Easy & simple calculatio for Thermal conductivity
- Simple structure, stable and reliable
- Data output easily exported to MS excel
- Convenient USB interface to Laptop or PC
- Sealed structure for prevent influenced by outside
- Operation check color LED indicator
- Easy coherence check of upper and lower phillar by light source
- Automatic adjusting measuring temperature conditions

Quantum-TCD Software

SEO Quantum-E software designed for
Thermal Conductivity tester.
It can calculate and determine Thermal conductivity,
thermal resistance under ASTM 5470
Vertical and Horizontal Method (Ångström) of solid samples.
The software can analyze thermal conductivity
automatically and precisely.
Also additional tools are available for user convenience.