



Theory of the Method

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The Heated Cylinder Method used in the TUBER100 instrument is based on one-dimensional Fourier's law written in cylindrical coordinates:

$$P/L = -\lambda \cdot 2\pi r (dT/dr) \quad (1)$$

where P/L is thermal flux (W/m) per unit of length, flowing through cylindrical surface with radius r and surface area $2\pi rL$ (m²), λ is thermal conductivity (W m⁻¹ K⁻¹), dT/dr is temperature gradient (K m⁻¹) at this cylindrical surface. It is supposed that $L \gg r$.

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If a hollow cylindrical sample under study is inserted between two isothermal cylindrical surfaces maintained at two stable different temperatures, the differential equation (1) for this case can easily be solved by the standard method of separation of variables, and the sample's thermal conductivity then can be calculated:

$$\lambda = P \ln(D_{ext}/D_{int}) / (2\pi L \Delta T) \quad (2)$$

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The temperature difference in the sample ΔT can be determined by measurements of the temperatures of the internal and external surfaces T_{int} and T_{ext} ($\Delta T = T_{int} - T_{ext}$). The power P , the sample's length L , and both diameters of the sample can be measured too. Temperature along the sample's axis is maintained uniform and one-dimensional radial temperature field can be established using two controlled guard end heaters.

If you have questions – feel free to call, fax or e-mail to LaserComp, Inc.:
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