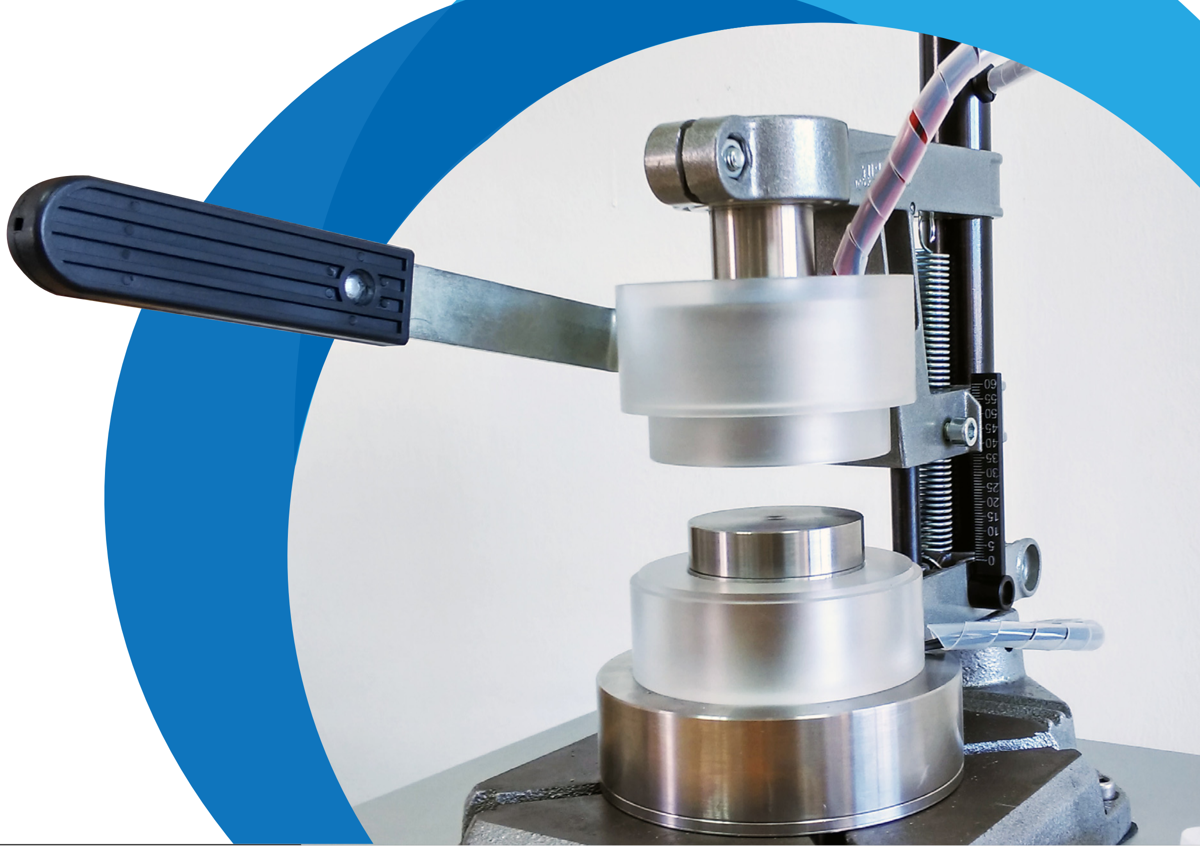
Thermal Conductivity of Solids
Guarded Heat-Flow Technique

ghf-01S

An easy to operate instrument
with 5% uncertainty



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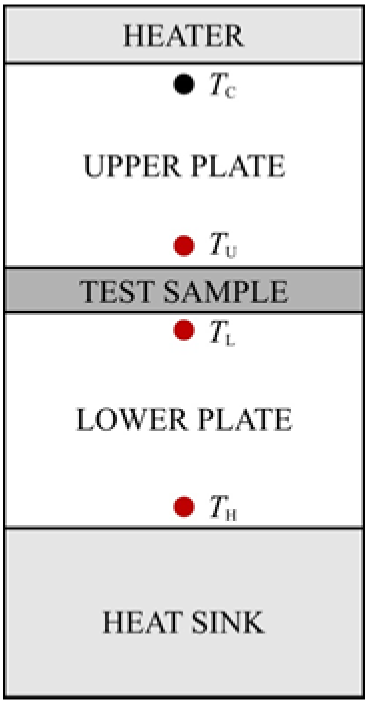


The instrument is composed from the following parts shown in the figure.

a) **Top heater**
The heater on the top of the stack, provides the necessary heat electrically, and is kept at 50'C.

b) **Upper plate**
The upper incorporates the heater controlling thermistor, T_C, on its top, and an additional thermistor, T_U, to record the temperature just over the sample.

c) **Test sample**
The test sample is placed between the upper and the lower plate.

d) **Lower plate**
On its top, just under the test sample, a thermistor, T_L, records the temperature, while at its bottom another thermistor, T_H, registers the temperature of the bottom heat sink (water).

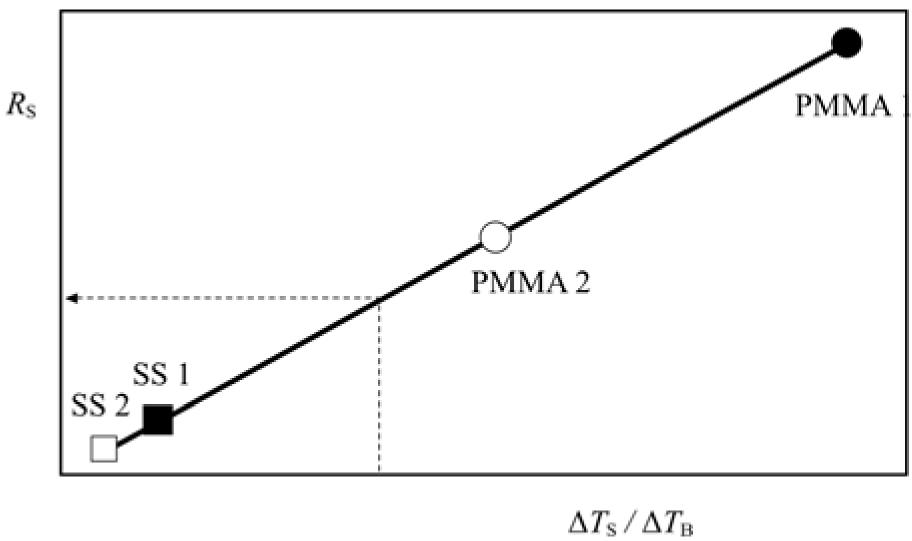
According to Fourier's Law for heat conduction, the thermal conductivity is the property of a material to conduct heat. **The material must be homogeneous.**

The calibration takes place using four samples of known thermal conductivity (and thickness). Consider for example, two reference samples of stainless steel (of different thickness) and two of PMMA. Once thermal equilibrium is reached, the procedure adopted for every sample is the following:

a) The three temperatures, T_U, T_L, and T_H are recorded, and the temperatures differences, ΔT_S (=T_U-T_L) and ΔT_B (=T_L-T_H) are calculated.

b) The thermal resistance R_S (= λ/*d*) is calculated from the ratio of the known thermal conductivity, λ, and the known sample's thickness, *d*.

c) The four pairs of ($\Delta T_S/\Delta T_B$) and R_S, are placed on a graph, and form the calibration line as illustrated. Thus, the unknown thermal conductivity of a sample can be obtained from the calibration line, by measuring the above temperature differences.



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Guarded Heat-Flow Technique

ghf-01S

- Measurement of the thermal conductivity of solids (0.1 to 14 $Wm^{-1}K^{-1}$)
- Operates according to Guarded-Heat Flow technique (ASTM E1530)
- Reliable results with an uncertainty of 5%
- Includes reference samples of SS, Pyrex glass and PMMA
- Easy to operate
- Sample of 50.8 mm diameter (2 in) and thickness of up to 15 mm

The ghf-01S operates according to the ASTM E1530 Guarded Heat Flow Meter technique, for the measurement of the thermal conductivity of solids. According to this technique, the sample is subjected to a steady-state axial temperature gradient. The thermal conductivity of the sample is obtained by measuring the temperature difference across it, and one additional temperature. Prior to the measurement, calibration is required using four samples of known thermal conductivity (and thickness), supplied with the instrument.

One of the main advantages of our technique, is that the whole procedure of measurement is very simple and can be accomplished by untrained personnel.

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