

Laboratory 2: Radial Heat Transfer by Thermal Conduction ME 430L

PURPOSE:

The purpose of this experiment is to determine the thermal conductivity of an unknown material (developed alloy). This will be accomplished by measuring the temperature distribution for steady state, one dimensional, heat transfer through an unknown substance and calculating the thermal conductivity of the unknown. Also, you want to show the transient temperature profile with time, until steady state conditions are reached.

EQUIPMENT:

- Armfield Heat Conduction Apparatus
- Stop watch or other timing device

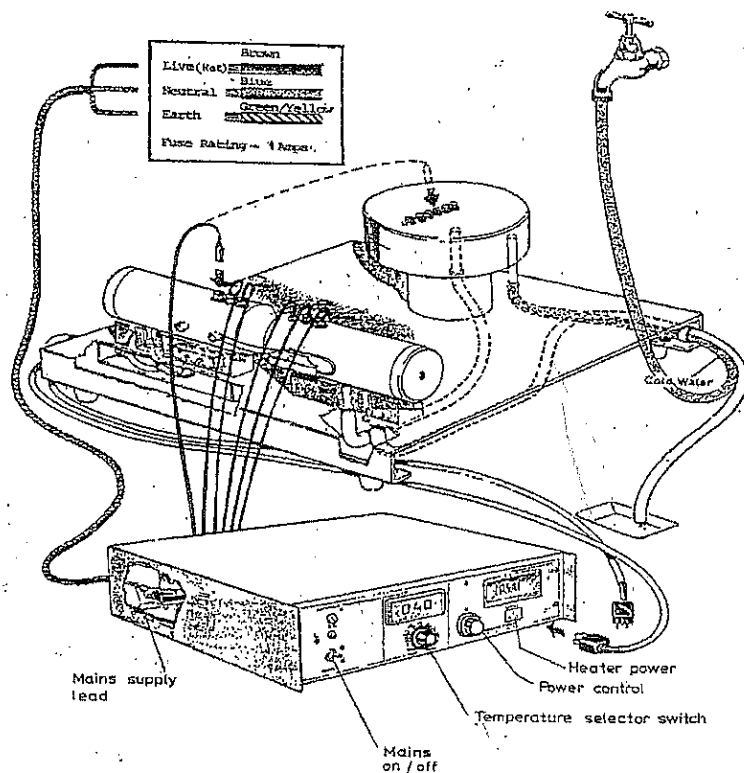


Figure 1: Armfield heat conduction apparatus diagram



Key to components shown in Figure 2:

1. Heat Input Section
2. Brass Fitted with an electrical heater
3. Three thermistor temperature sensors
4. Separate heat sink section
5. Brass cooled at one end by running water
6. Thermistor temperature sensors
7. A brass section '30 mm long and 25 mm diameter.
8. Thermistor sensors
9. This section is from brass 30 mm long and 13 mm diameter
10. Stainless steel section 30 mm long and 25 mm diameter
11. Heat resistant casing
12. Enclosed air space around the module
13. Attached casing pieces
14. Attached casing pieces
15. Attached casing pieces
16. Miniature plugs
17. Metal disc of 110mm diameter and a thickness of 3 mm
18. Electrical heater
19. Circumferential copper tube
20. Thermistor temperature sensors
21. Air gap
22. Heat resistant casing t
23. Plugs in the casing

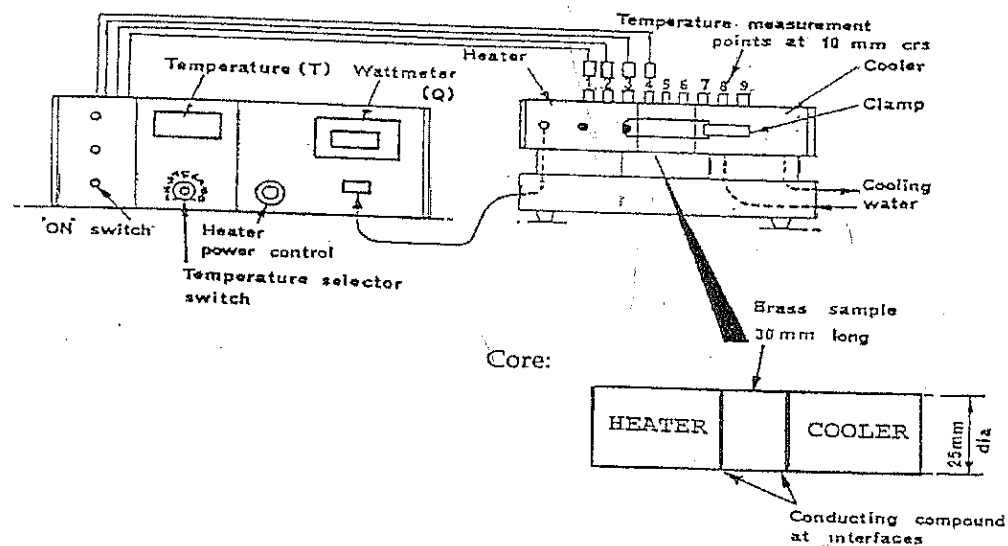


Figure 3: Details of Armfield Conduction Apparatus

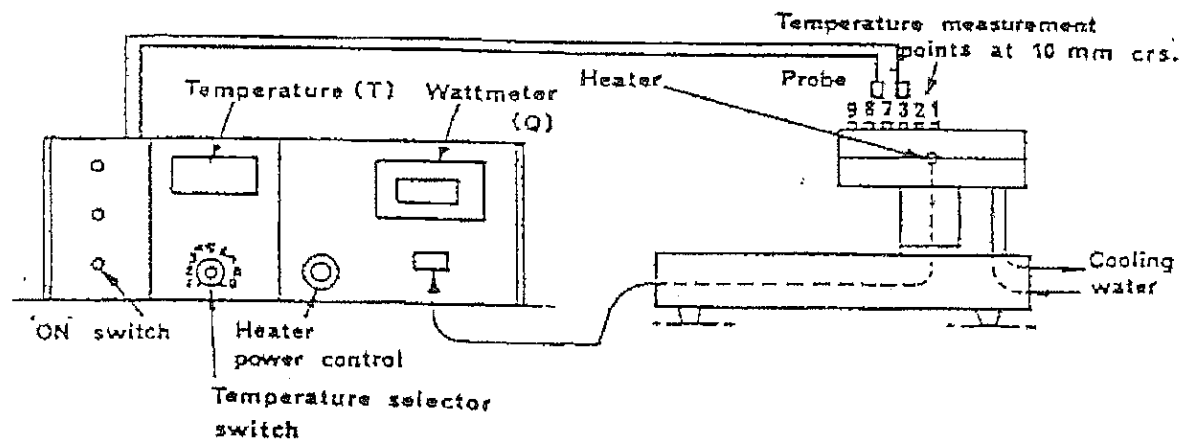


Figure 4: Radial Heat Conduction Apparatus

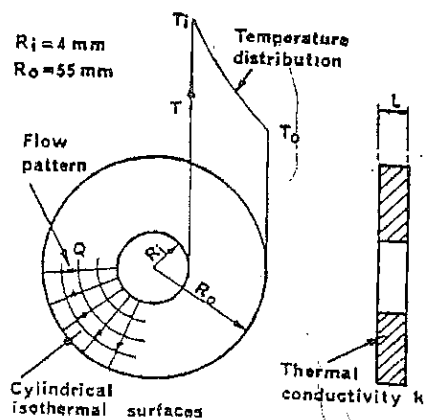


Figure 5: Schematic of Radial Heat Conduction

EXPERIMENTAL PROCEDURE

1. Switch the apparatus to the radial system.
2. Start the cooling water running
3. Set the power control dial at ____ W.
4. Record the input power reading
5. Record the temperature at all six points (thermistors), at intervals of time till steady state conditions are reached.