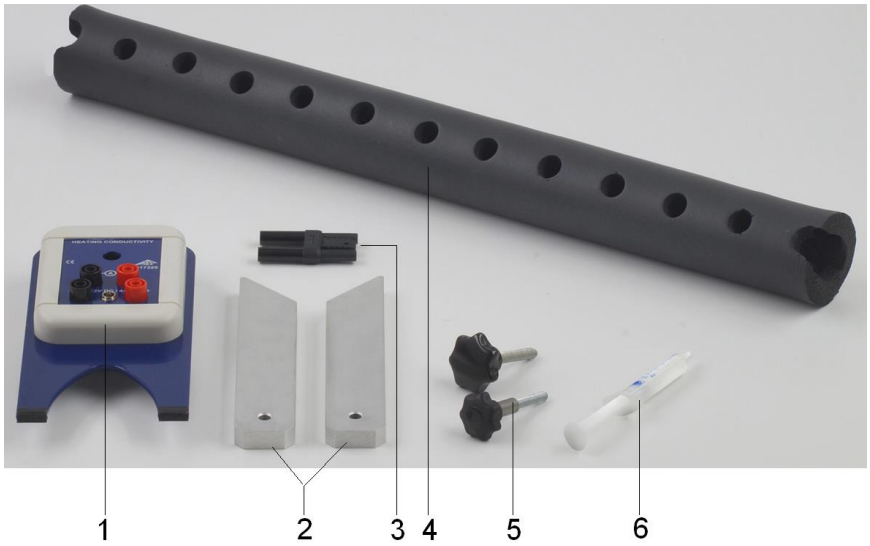
Thermal Conduction Equipment Set 1017329

Instruction manual

10/15 ALF



1 Heating module
2 Cooling slats
3 Jumper
4 Insulating sleeve
5 Fastening screws
6 Thermal conductive paste

1. Safety instructions

Caution: risk of burn injuries.

- Do not heat the thermal conduction bar without the insulating sleeve around it
- Before dismantling the experiment, allow the heater module and the conduction bar to cool down.
- Do not operate the heating module without a conduction bar screwed in.

The heating module fulfils safety regulations for electrical measurement, control and laboratory equipment as per DIN EN 61010.

- Operate the equipment with a power supply of at least 12 V DC/4 A.

For the purpose of taking measurements, the equipment is not fitted with protection against reversal of polarity.

- Take care to get the sockets the right way round when connecting the power (red = positive).

2. Description

This equipment set makes it possible to carry out experiments on the thermal conductivity of metals using a non-hazardous horizontal set-up which avoids the use of boiling water.

An electronically controlled heat source feeds heat to the thermal conduction bar. The electrical power supplied in this way can be determined by connecting a voltmeter and ammeter to the pairs of sockets provided. The insulating sleeve serves to reduce heat losses to the surroundings and also improves the linearity of the steady-state temperature profile. Heat can be dissipated via cooling slats.

Fig. 1 Heating module controller

1 Stand base, 2 Co-axial socket for connection to table-top power supply (1017579), 3 4-mm safety sockets for connecting voltmeter or DC lab power supply, 4 4-mm safety sockets for connecting ammeter or shorting jumper, 5 Drill hole for fastening screw

3. Contents

1 Heating module
1 Insulating sleeve
2 Cooling slats
1 Jumper
2 Fastening screws
Thermal conductive paste

4. Technical data

Maximum heating power:	43 W approx.
Maximum power loss:	4.5 W approx.
Temperature of heat source:	105°C
Operating voltage:	12 V DC
Maximum heating current:	4 A

5. Operation

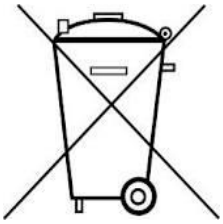
The following additional equipment is needed to carry out the experiments:

1 Copper thermal conduction bar 1017330
or
1 Aluminium thermal conduction bar 1017331
1 Table-top power supply 1017579
or
1 DC power supply, 20 V, 5 A (230 V) 1003312
or
1 DC power supply, 20 V, 5 A (115 V) 1003311
and
1 Pair of safety experiment leads
1 Digital quick response pocket thermometer 1002803
1 K-type NiCr-Ni immersion sensor 1002804
1 Squat glass beaker

- Clean the contact points on the bar and give them a very thin coat of thermal conductive paste.
- Attach the heating module to the thermal conduction bar by means of the fastening screw. Set up the bar in such a way that the holes (temperature measuring points) face upwards.
- Slip the insulating sleeve over the conduction bar and line up the holes in the foam over the temperature measuring points.
- Screw the cooling slats loosely to the end of the bar with a fastening screw. Line them up in the cooling vessel and then tighten the screw.
- Fill the beaker with ice and water, which may need to be topped up in the course of the experiment.
- In order to supply power to the heat source, connect a table-top power supply (1017579) via the co-axial connector socket or, alternatively use a DC power supply via the terminal sockets. Make certain you have the polarity right: red = positive pole. The second pair of sockets should be shorted by the jumper.
- In order to measure the operating voltage, connect an ammeter to the two upper sockets in place of the shorting jumper.
- To determine the electrical power consumed (product of voltage and current) to the optimum precision, measure the voltage directly from the heating module via the lower pair of sockets rather than reading it off the power supply.
- Measure the temperature with an electronic thermometer (quick-response sensor with thermocouple) from positions 1 to 13 along the thermal conduction bar at intervals which are as equal as possible. Put a small amount of thermal conductivity paste on the measuring points each time before doing this.
- Repeat the measurements until a steady state is reached and then plot the sets of measurements on a graph.

6. Disposal

- The packaging should be disposed of at local recycling points.
- Should you need to dispose of the angle sensor, never throw it away in normal domestic waste. Local regulations for the disposal of electrical equipment will apply.



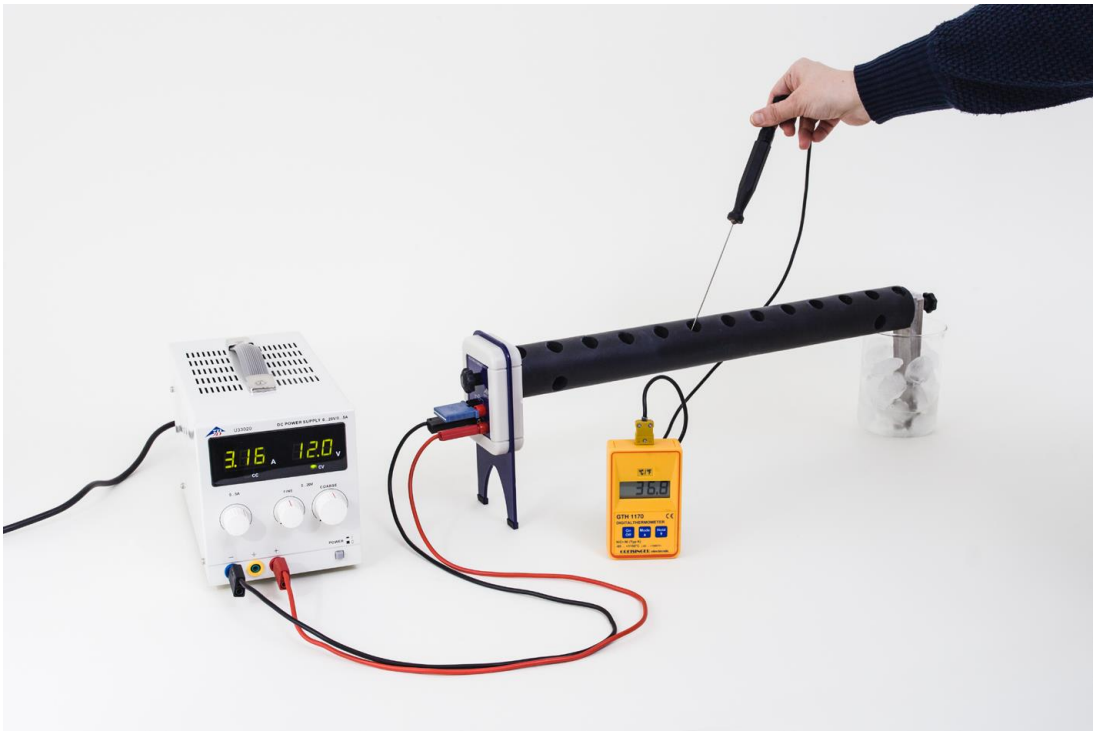


Fig. 2 Experiment set-up for measuring thermal conductivity

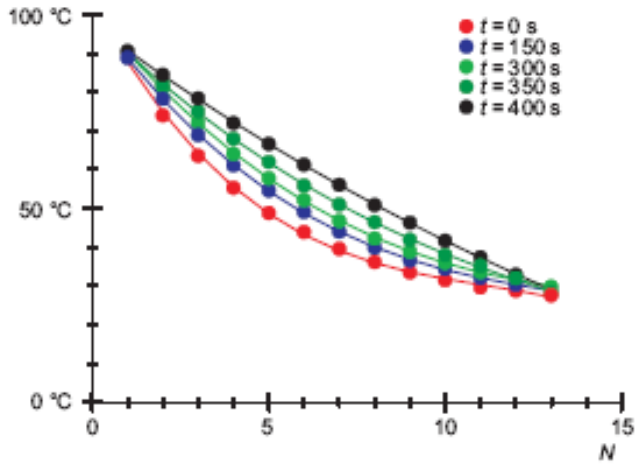


Fig. 3 Five sets of measurements of temperature along aluminium bar