WL 420

Heat conduction in metals

Description

- **effect of different metals on heat conduction**
- **functions of the GUNT software: educational software, data acquisition, system operation**
- **part of the GUNT-Thermoline: Fundamentals of Heat Transfer**

Heat conduction is one of the three basic forms of heat transfer. According to the second law of thermodynamics, heat is always transferred from the higher energy level to the low energy level. If the temperature of a body does not change despite continuous addition or removal of heat, this is known as steady-state heat conduction.

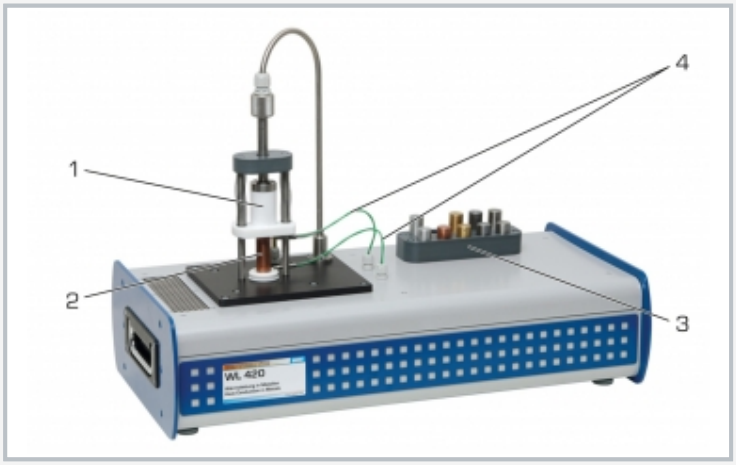
WL 420 offers basic experiments for targeted teaching on the topic of heat conduction through various metals. To this end, one of eleven samples is used. The upper region of the sample is heated by an electrical heater and the lower section cooled by a Peltier element. Heat conduction occurs through the respective sample from top to bottom. Two samples can be inserted into the experimental unit at the same time, in order to investigate thermal conductivity through multi-layered metals. Perfectly matched components ensure rapid heating and trouble-free measurements.

The temperature of the metal samples is taken on the top and bottom by means of thermocouples. The microprocessor-based instrumentation is well protected in the housing. The GUNT software consists of a software for system operation and for data acquisition and an educational software. With explanatory texts and illustrations the educational software significantly aids the understanding of the theoretical principles. The unit is connected to the PC via USB.

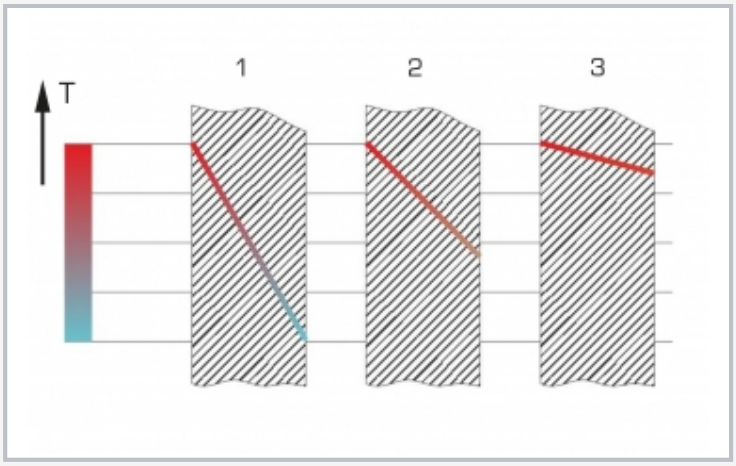
Learning objectives/experiments

- time dependency until the steady state is reached
- calculate the thermal conductivity λ of different metals
- calculate the thermal resistance of the sample
- heat transfer with different samples connected in series
- effect of sample length on heat transfer

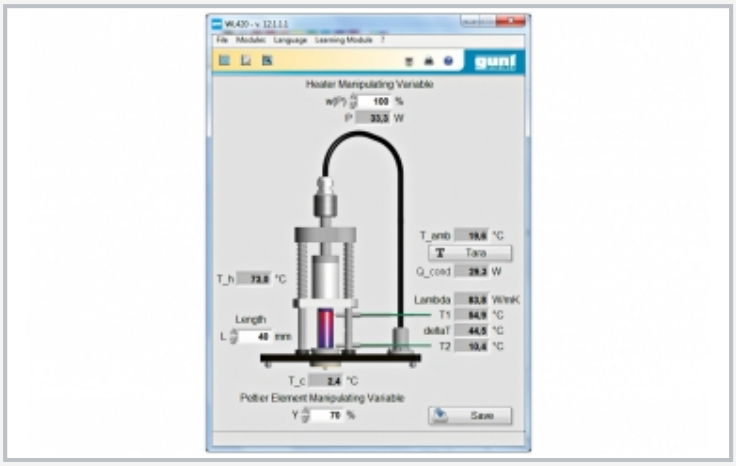
WL 420
Heat conduction in metals



1 heater, 2 sample, 3 storage for samples, 4 thermocouple; Peltier element concealed



Heat conduction through different metals: 1 temperature profile in metal with low thermal conductivity, 2 temperature profile in metal with medium thermal conductivity, 3 temperature profile in metal with high thermal conductivity; T temperature; red: hot, blue: cold



User interface of the powerful GUNT software

Specification

[1] investigation of the thermal conductivity of different metals
[2] continuously adjustable heater
[3] Peltier element as cooler
[4] 11 samples made of 5 metals, different lengths
[5] display of temperatures and power consumption in the software
[6] microprocessor-based instrumentation
[7] functions of the GUNT software: educational software, data acquisition, system operation
[8] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

Peltier element
- cooling capacity 56,6W

Heater
- heating power 30W
- temperature limitation: 150°C

Samples Ø20mm
Length between measuring points
- 5x 20mm (copper, steel, stainless steel, brass, aluminium)
- 5x 40mm (copper, steel, stainless steel, brass, aluminium)
- 1x 40mm with turned groove (aluminium)

Measuring ranges
- temperature: 2x 0...325°C
- heating power: 0...50W

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 670x350x480mm
Weight: approx. 18kg

Required for operation

PC with Windows

Scope of delivery

1 experimental unit
11 metal samples
1 CD with authoring system for GUNT educational software
1 GUNT software CD + USB cable
1 set of instructional material

WL 420
Heat conduction in metals

Optional accessories

020.30009	WP 300.09	Laboratory trolley