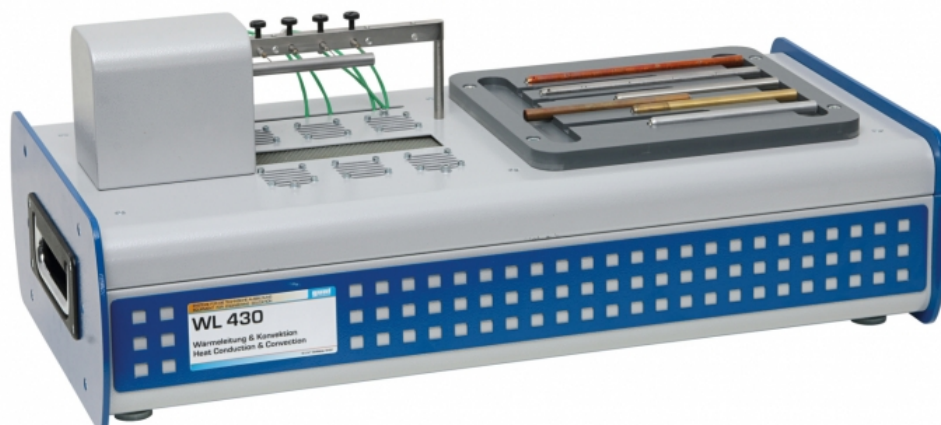# WL 430
Heat conduction and convection

Description

- **effect of heat conduction and convection on heat transfer**
- **experiments with still air on free convection**
- **functions of the GUNT software: educational software, data acquisition, system operation**
- **part of the GUNT-Thermoline: Fundamentals of Heat Transfer**

Heat conduction and convection are among the three basic forms of heat transfer and often occur together.

WL 430 allows basic experiments on both forms of heat transfer: heat conduction and convection.

At the heart of the unit are different metal samples. One of these samples is placed on a heater and heated on one side. The heat is conducted through the sample and dissipated to the environment. The sample used behaves like a cooling fin. In addition there are fans below the sample. The flow rate of the fans is continuously adjustable in order to influence the convective heat transfer. The air flow is conveyed evenly around the sample. Consequently, besides conducting the experiment with still air (free convection), it is also possible to conduct experiments with flowing air (forced convection).

The effect of different materials on heat conduction is demonstrated by comparing different samples.

The experimental unit is equipped with five temperature sensors. Heating power and flow velocity of the air flow are adjusted and displayed via the software.

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

- effect of heat conduction and convection on heat transfer
- effect of free and forced convection on heat transfer
- calculate convective heat transfers
- effect of different materials on heat conduction
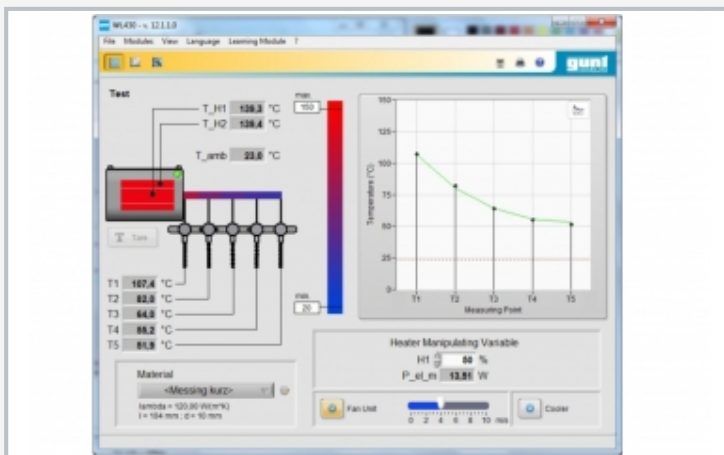- effect of sample length on heat transfer

WL 430
Heat conduction and convection
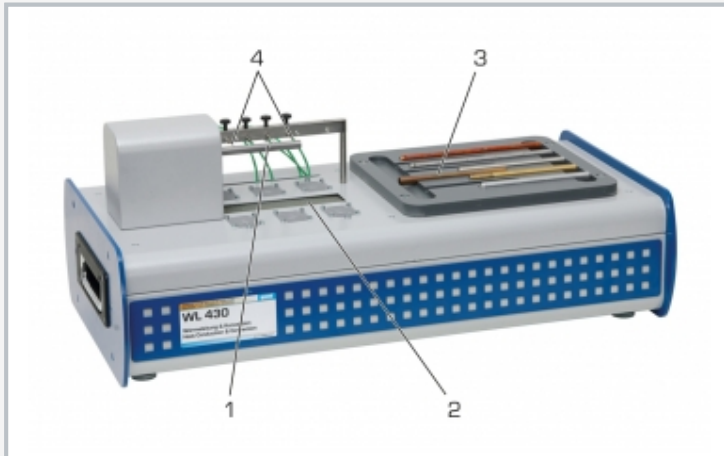
1 sample, 2 air vent, 3 storage for samples, 4 thermocouple
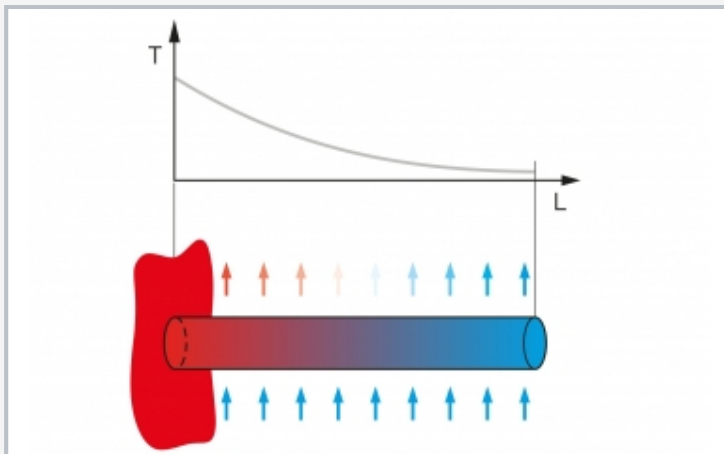
Temperature profile along a sample: red: hot, blue: cold; T temperature, L length of the sample; arrows: air flow

User interface of the powerful GUNT software

Specification

[1] investigate heat conduction and convection using the example of a cooling fin
[2] cooling fin: sample heated at one end, made of metal
[3] 6 samples made of different materials and with different lengths
[4] 6 fans for experiments with forced convection
[5] continuously adjustable heating power and fan power
[6] display of temperatures, heating power and air velocity in the software
[7] microprocessor-based instrumentation
[8] functions of the GUNT software: educational software, data acquisition, system operation
[9] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

Heater
- heating power 30W
- temperature limitation: 160°C

6x fan
- max. flow rate: 40m^3/h
- nominal speed: 14400min^{-1}
- power consumption: 7,9W

4x samples, short
- length dissipating heat: 104mm
- heat transfer area: 32,6cm^2
- copper, aluminium, brass, steel
2x samples, long
- length dissipating heat: 154mm
- heat transfer area: 48,4cm^2
- copper, steel

Measuring ranges
- flow velocity: 0...10m/s
- temperature: 8x 0...325°C
- heating power: 0...30W

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 670x350x280mm
Weight: approx. ca. 17kg

Required for operation

PC with Windows

Scope of delivery

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

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Optional accessories

020.30009	WP 300.09	Laboratory trolley