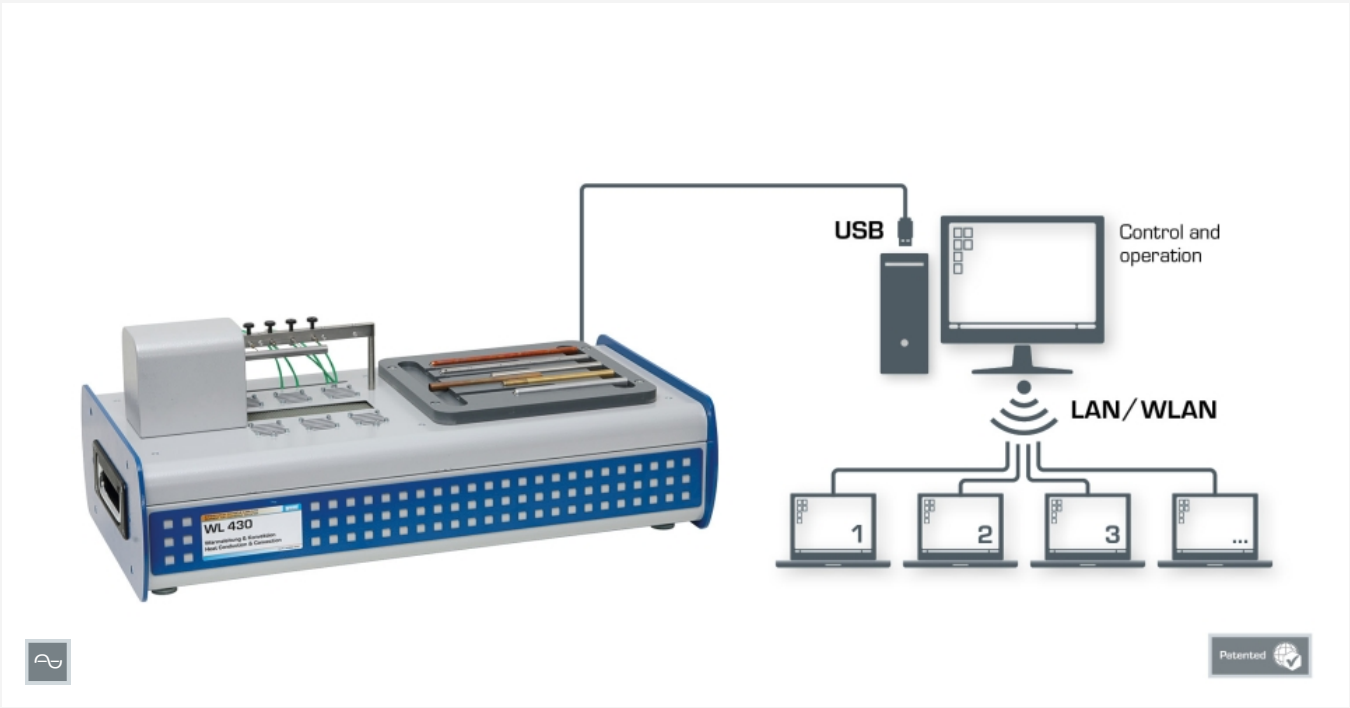
WL 430

Heat conduction and convection



Complete experimental setup with one PC for control and operation and any number of workstations with GUNT software for observation and evaluation of the experiments.

Description

- **effect of heat conduction and convection on heat transfer**
- **experiments with still air on free convection**
- **network capability: network access to ongoing experiments by any number of external workstations**
- **GUNT software: operation and control of the experimental unit, data acquisition and educational software**
- **E-Learning: multi-media didactic materials accessible online**

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. The unit focuses on different metal specimens. The specimens are placed on a heater and are heated on one side. The heat is conducted through the specimen and dissipated to the environment. The specimen used behaves like a cooling fin. In addition there are ventilators below the specimen. The flow rate of the ventilators is continuously adjustable in order to influence the convective heat transfer. The air flow is conveyed evenly around the specimen. 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 specimens.

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 operation and control of the experimental unit is carried out via a PC (not included in the scope of delivery) connected via a USB interface. Any number of workstations with the GUNT software can be used for observation and evaluation of the experiments via LAN/WLAN connection using only one licence.

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 specimen length on heat transfer
- GUNT E-Learning
  - multi-media online course, which enables learning independent of time and place
  - access via Internet browser
  - educational software including different learning modules
  - course in the fundamentals
  - detailed thematic courses
  - check through targeted review of the learning objectives
  - authoring system with editor that enables you to integrate your own, local content into the educational software

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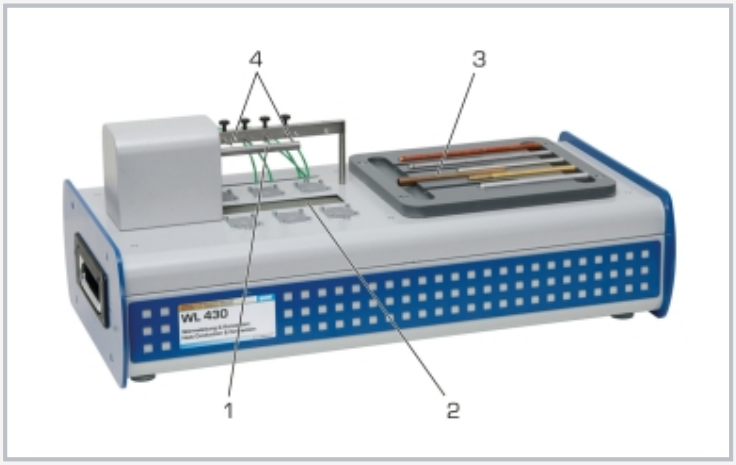
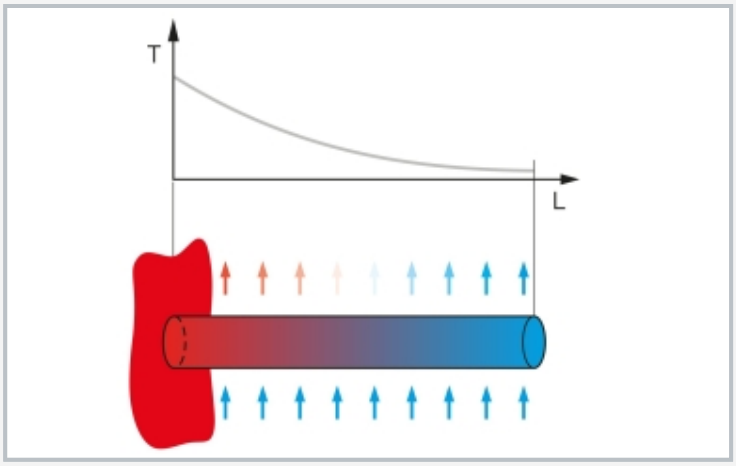
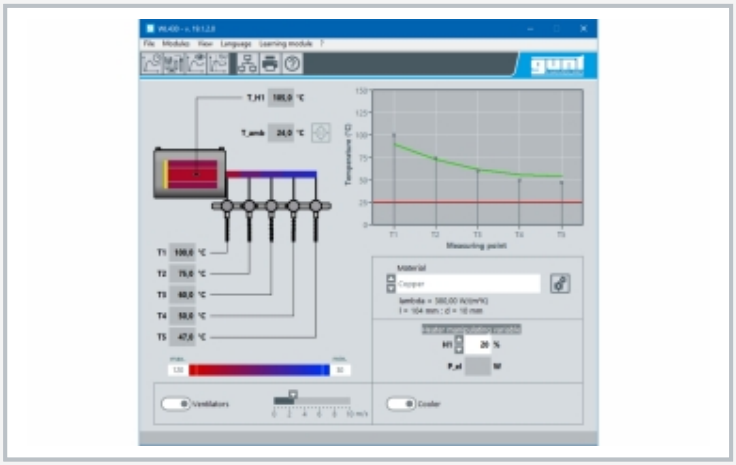
Heat conduction and convection



1 sample, 2 air vent, 3 storage for samples, 4 thermocouple



Temperature profile along a specimen: red: hot, blue: cold; T temperature, L length of the specimen; arrows: air flow



User interface of the powerful GUNT software

Specification

[1] part of the GUNT-Thermoline: Fundamentals of heat transfer
[2] investigate heat conduction and convection using the example of a cooling fin
[3] cooling fin: specimen heated at one end, metal
[4] specimens made of different materials and with different lengths
[5] ventilators for experiments with forced convection
[6] continuously adjustable heating and ventilator power
[7] display of temperatures, heating power and air velocity in the software
[8] due to integrated microprocessor-based instrumentation no additional devices with error-prone wiring are required
[9] functions of the GUNT software: system operation, data acquisition, educational software
[10] network capability: LAN/WLAN connection of any number of ext. workstations with GUNT software for observation and evaluation of the experiments
[11] E-Learning: multi-media didactic materials accessible online
[12] GUNT software for data acquisition via USB under Windows 10

Technical data

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

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

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

2x specimens, 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
- heater power: 0...30W

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

Required for operation

PC with Windows

Scope of delivery

experimental unit, 1 set of specimens , 1 thermal paste, 1 authoring system for GUNT educational software, 1 GUNT software + USB cable, 1 set of instructional material