WL 460
Heat transfer by radiation

Description

- **effect of different surfaces on heat transfer by radiation**
- **functions of the GUNT software: educational software, data acquisition, system operation**
- **part of the GUNT-Thermoline: Fundamentals of Heat Transfer**

Heat radiation is one of the three basic forms of heat transfer. In radiation the heat transfer takes place via electromagnetic waves. Unlike heat conduction and convection, heat radiation can also propagate in a vacuum. Heat radiation is not bound to a material.

WL 460 offers basic experiments for targeted teaching on the topic of heat transfer by radiation. At the heart of the experimental unit is a metallic sample heated by a concentrated light beam. The light beam is generated by a continuously adjustable halogen lamp and a parabolic reflector. The reflector concentrates the radiation to a focal point. A sample is placed on a thermocouple located at the focal point. The thermal radiation emitted by the sample is measured by a thermopile. In order to be able to measure the radiation at different distances, the thermopile is mounted on a moveable carriage.

Samples with different surfaces are available to be selected. Perfectly matched components ensure rapid heating and trouble-free measurements.

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.
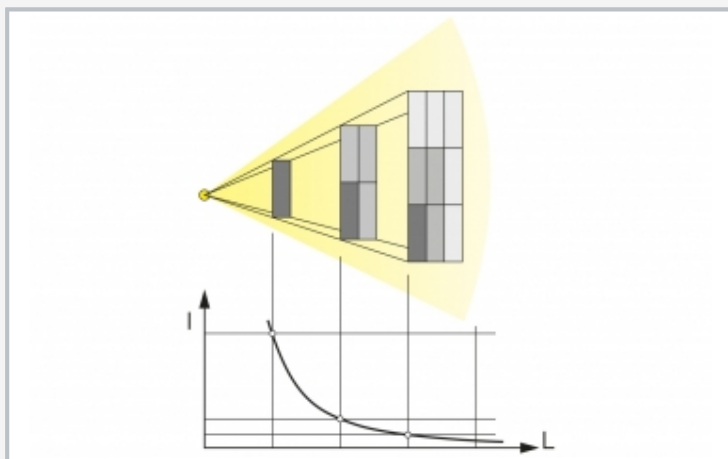
Learning objectives/experiments

- verify Lambert's inverse-square law
- verify Stefan-Boltzmann law
- verify Kirchhoff's law
- study transient behaviour
- create power balances
- produce logarithmic diagrams for evaluations

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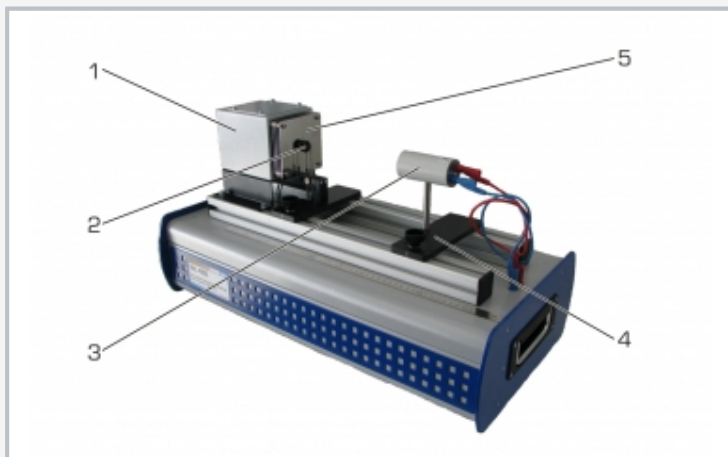
1 lamp housing, 2 sample placed on thermocouple, 3 thermopile, 4 movable carriage, 5 orifice plate

Radiation intensity with point-based radiation source: I intensity of the radiation, L distance to the radiation source (Lambert's inverse-square law)

User interface of the powerful GUNT software

Specification

[1] investigation of heat radiation on different surfaces heated by a concentrated beam of light
[2] generation of the concentrated beam of light with a continuously adjustable halogen lamp and a parabolic reflector
[3] 6 different metallic samples
[4] thermopile on a movable carriage for measuring the heat radiation
[5] display of temperature and radiation intensity 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

Halogen lamp
- electrical power 150W
- max. temperarature: approx. 560°C

Aluminium samples, Ø=20mm
- 1x matt anodized on both sides
- 1x painted on both sides (high-temperature paint)
- 1x matt anodized with one painted side

Copper samples, Ø=20mm
- 1x nickel-plated
- 1x heavily oxidized

Steel sample, Ø=20mm
- 1x heavily oxidized

Measuring ranges
- temperature: 0...780°C
- radiation intensity: 0...1250W/m^2

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase
UL/CSA optional
LxWxH:LxBxH: 670x350x370mm
Weight: approx. 18kg

Required for operation

PC with Windows

Scope of delivery

1 experimental unit
6 different 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 |

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