WL 110 Series
Heat Exchanger with Supply Unit

Overall didactic concept for practical-based teaching of the thermal processes in heat exchangers.

- practice-oriented components
- modular
- software-assisted
- training software

The system for a simple introduction to a complex subject.
Overall Didactic Concept

The transfer of heat, with its different forms of transfer, is the foundation of thermodynamics. The controlled transfer of heat takes place in a heat exchanger. Depending on the requirements, different heat exchangers are used in practice in order to enable an efficient transfer of heat.

Students often find the notoriously difficult and dry content of applied thermodynamics hard to understand. The WL 110 series helps to methodically link and apply learnt theory with real world, practical components.

We speak from experience and, with our educationally beneficial overall concept, we want to help you to teach this complex subject.

The modular WL 110 series of equipment offers extensive experiments on different heat exchangers. Different models of heat exchangers are investigated and compared with each other.

In order to visualise the thermal processes in the heat exchanger, our innovative and powerful software is an integral part of the training system. The software enables a unique form of representation and helps students to conduct and evaluate experiments. The software deliberately helps create a link between practice and theory.

To complete our overall didactic concept, WL 110 includes multimedia training software which supports students in the preparation and follow-up of experiments. The training software enables independent learning of the theoretical fundamentals and, through explanatory texts, illustrations and moving images, contributes to understanding of the topic.
Setup

WL 110 Series  Heat Exchanger with Supply Unit

WL 110.01  Tubular Heat Exchanger
WL 110.02  Plate Heat Exchanger
WL 110.03  Shell and Tube Heat Exchanger
WL 110.04  Jacketed Vessel with Stirrer and Coil
WL 110.20  Water Chiller

WL 110  Heat Exchanger Supply Unit
The supply unit produces hot water. All measured values can be displayed on the device and transferred via a USB connection.

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The water chiller can be used to operate the heat exchangers under suitable experimental conditions.

The different heat exchangers are placed on the supply unit and connected to it by hoses.

1. heater
2. tank for hot water
3. data acquisition, flow rate/temperature
4. heat exchanger
5. refrigerating plant
6. tank for cold water
Tubular heat exchangers are the simplest type of heat exchanger design. They are preferred when heat is being transferred at high pressure differences or between highly viscous media. One advantage is that flow through the pipe space is even and free of flow dead zones.

The hot water is fed through the core tube (inner) and the cold water fed through the jacket tube (outer). In doing so, the hot water continuously emits some of its thermal energy to the cold water.

Two additional temperature sensors are located on the tubular heat exchanger to measure the temperature after one half of the transfer section.

Plate heat exchangers are mainly characterised by their compact structural shape, in which the entire medium is used for heat transfer. One advantage is the low space requirement, relative to the heat transfer area.

The plate heat exchanger consists of several profiled plates. Connecting the plates to each other results in two hermetically separated tube channels. A cold tube channel and a hot tube channel alternate in the arrangement. The narrow tube channels produce turbulent flow.

**Learning objectives/experiments**

- Function and behaviour of a tubular heat exchanger during operation
- Recording temperature curves
  - In parallel flow operation
  - In counterflow operation
- Calculation of mean heat transfer coefficient
- Comparison with other heat exchanger types

**Learning objectives/experiments**

- Function and behaviour of a plate heat exchanger during operation
- Plotting temperature curves
  - In parallel flow operation
  - In counterflow operation
- Calculation of mean heat transfer coefficient
- Comparison with other heat exchanger types
WL 110.03 Shell and Tube Heat Exchanger

Shell and tube heat exchangers are characterised by the large heat transfer area and the compact structural shape. The shell and tube heat exchanger consists of seven core tubes, surrounded by a transparent jacket tube. The hot water flows through the core tubes and the cold water flows through the jacket tube. In doing so, the hot water emits some of its thermal energy to the cold water. Using baffles, the flow in the inside of the shell is diverted in order to produce stronger turbulence and more intensive convective heat transfer. The media flow continuously in cross flow.

WL 110.04 Jacketed vessel with stirrer and coil

Many engineering processes use simple stirrer tanks. These are often fitted with a double jacket or a coiled tube for cooling or heating. Stirring machines are used for better mixing of the tank contents and for an even temperature distribution.

The jacketed vessel with stirrer and coil consists of a tank surrounded by a jacket. In the tank is a coiled tube. In the heating with jacket operating mode, the hot water flows through the jacket and emits some of its thermal energy to the cold water in the tank. In the heating with coiled tube operating mode, the hot water flows through the coiled tube and heats the cold water in the tank. A stirring machine can be used in all operating modes.
**Operation and Data Acquisition**

**Operation**
- simple operation of the system directly on the supply unit
- set flow rate, temperature and stirrer speed
- read and control measured values

**Time dependency**
- representation of the measured values as a function of time
- plotting and logging characteristics
- freely selectable form of presentation of the measured values
  - selection of measured values
  - resolution
  - colour
  - time interval

**System diagram**
- selection and visualisation of the operating mode
- display all temperatures and flow rates in real time

**Representation of the thermal states in the heat exchanger**

**Temperature profile**
- representation of the temperature profiles along the heat exchanger
- calculation and display of the characteristic variables of the heat exchanger
- visual comparison between the different operating modes of parallel flow and counterflow
- comparability of different heat exchangers
Operation and Data Acquisition

Network capability
- full network access to ongoing experiments by any number of external workstations
- experiments can be independently followed and evaluated by students at all workstations when using a single training system

Display
- flexibility in position and arrangement of the various program windows
- different windows that simultaneously visualise the operating behaviour of the system in different ways

Multi Window Function

...any number of workstations with GUNT software with just a single licence
Training Software
An important component in addition to operation and data acquisition

Course in the fundamentals
Educationally thought-out and media-rich learning content in the field of heat transfer

Detailed description of the equipment
- independent preparation for handling the equipment
- explanation of how the equipment works
- function description of the individual components

E-learning
- multimedia course on home PC
- flexibility thanks to learning at your own pace, anywhere and at any time
- increased motivation through originality and playful approach to learning material
- ideal complement to the classroom

Targeted review of the learning
- allows learning progress to be checked discreetly and automatically
- detect weaknesses and provide targeted support
Training Software
An important component in addition to operation and data acquisition

Design freedom with integration of your own learning content via the authoring system
- no HTML knowledge required
- separate editor for creating the learning content
- intuitive operation
- targeted integration of specific learning content in the software structure
- creation of individual performance assessments
- integration of video clips and animated graphics

Benefits at a glance
- flexibility due to self-determination of the time, duration and location of the learning unit
- allows learning progress to be checked discreetly and automatically
- focus points can be repeated as often as required
- improves the workstation capacity of colleges
- targeted integration of your own learning content in the software structure
- integration of multimedia learning methodology in your students’ routine

For years we have stood for the highest quality of our equipment and the associated instructional material.
Join us to take another step towards the future.

To some of us it matters how heat is transferred...
A Few Impressions
An impression from the GUNT training centre

In addition to the software, the printed instructional material forms an integral part of our concept:
- fundamentals of heat transfer
- WL 110 experiment instructions
- authoring system operating instructions

WP 300.09
Laboratory Trolley
Forms a perfect base for a mobile training and experimental unit.

Do you need more in the field of refrigeration and air conditioning technology?
Then ask for our Catalogue 3, or visit gunt.de/static/s9_1.php