

## ET 300

### Finned tube heat exchanger water/air



#### Learning objectives/experiments

- familiarisation with the heat transfer process between water and air
- determination of heat flows from water and air
- determination of the efficiency or losses
- energy balances at the heat exchanger
- plot pump characteristic

#### Description

- convective heat transfer between water and air
- closed hot water circuit

Tubular heat exchangers are often used for heating or cooling gaseous media, such as air coolers for internal combustion engines. Hot water flows in the tubes, which are surrounded by a flowing gaseous medium, e.g. cold air. The hot medium emits some of its thermal energy to the cold medium.

The tubes are fitted with fins in order to increase the heat transfer surface and thus improve the convective heat transfer.

The ET 300 trainer is used for quantitative investigations on a finned-tube heat exchanger using the media hot water and cold air. The core element of the trainer is an air duct with fan, in which a finned-tube heat exchanger is installed.

A streamlined inlet element and a flow straightener in the air duct provide a homogeneous flow for carrying out the experiment. The volumetric flow rate is adjusted via a throttle valve at the fan outlet and measured by a measuring nozzle at the inlet into the fan.

The trainer has a closed hot water circuit consisting of: water tank with heater, pump, adjustable flow rate, electromagnetic flow rate sensor and finned-tube heat exchanger. The flow rate can be adjusted via a valve.

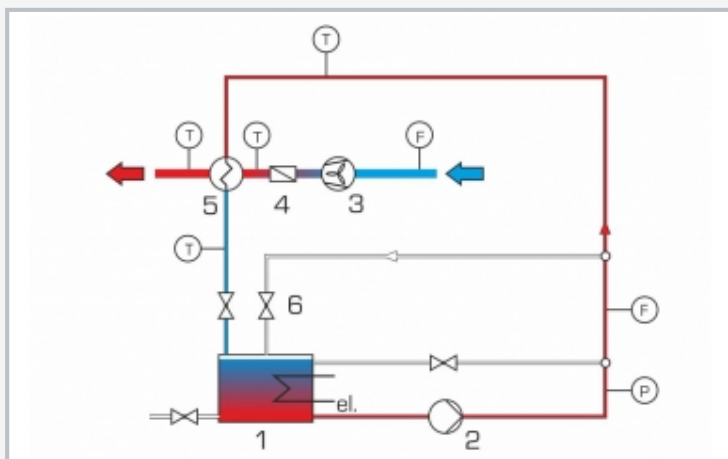
Energy balances can be established by measuring the inlet and outlet temperatures and the flow rates. In addition, a pressure sensor in the water circuit makes it possible to plot a pump characteristic. The measured values are read from digital displays and can be transmitted simultaneously via USB directly to a PC, where they can be analysed using the software included.

# ET 300

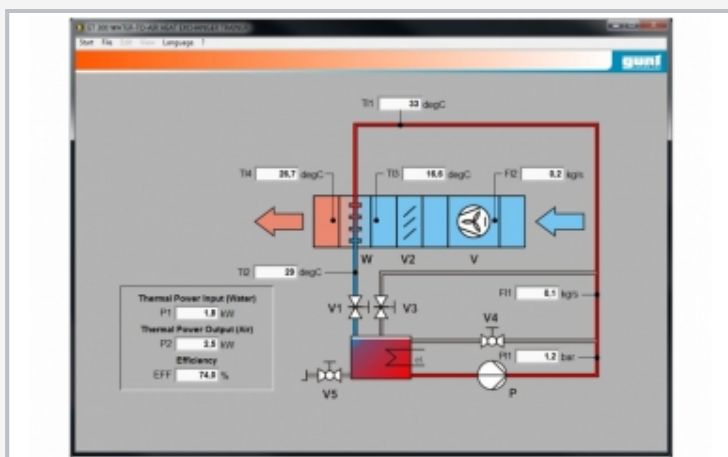
## Finned tube heat exchanger water/air



1 fan, 2 air duct with temperature measuring points, 3 heat exchanger, 4 flow meter, 5 pressure sensor, 6 water tank, 7 pump, 8 heater with thermostat, 9 displays and controls



1 water tank with heater, 2 pump, 3 fan, 4 throttle valve, 5 heat exchanger, 6 valves for adjusting the experiment (heat exchanger or pump characteristic); F flow rate, P pressure, T temperature



Software screenshot

### Specification

- [1] finned-tube heat exchanger to study convective heat transfer between water and air
- [2] function of the heat exchanger as an air heater or water cooler
- [3] closed hot water circuit with electric heater, thermostat, water tank and pump
- [4] adjustable water and air flow
- [5] determination of the air volumetric flow rate by differential pressure at measuring nozzle
- [6] digital display of temperatures, flow rates and pressure
- [7] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

### Technical data

Finned-tube heat exchanger

- material: Cu/Al
- average transfer surface: 2,80m<sup>2</sup> (air side)
- output: 2kW
- water temperature: 70°C

Pump

- power consumption: 470W
- max. flow rate: 4,2m<sup>3</sup>/h
- max. head: 20,5m

Fan

- power consumption: 0,25kW
- max. flow rate: 13m<sup>3</sup>/min
- max. pressure difference: 430Pa

Water tank: 28L

Heater: 2kW

Thermostat: max. 80°C

Measuring ranges

- temperature: 4x 0...100°C
- flow rate: water 0...6m<sup>3</sup>/h
- pressure: water 0...4 bar abs.
- mass flow: air 0...250g/s

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 1730x800x1900mm

Weight: approx. 220kg

### Required for operation

PC with Windows recommended

### Scope of delivery

- 1 trainer
- 1 GUNT software CD + USB cable
- 1 set of instructional material