ET 600
Conditioning of room air

Description

- **air conditioning system with steam humidifier**
- **wide experimental program for conditioning of room air**
- **representation of the thermodynamic principles in the log p-h and h-x diagram**

In many daily situations the condition of the ambient air does not meet requirements for e.g. a tropical greenhouse, the manufacture of sensitive components or even comfortable offices. The flow velocity, temperature and humidity of the air can be modified by air conditioning systems in accordance with the requirements for the desired room climate.

The trainer ET 600 examines the operation and effect of the individual components of an air conditioning system.
ET 600 includes all the components also used in building services engineering. Particular importance was placed on the use of original components.

For air conditioning, air cooler (direct evaporator with condensing unit), steam humidifier, fan, air preheaters and reheaters are arranged in an open air duct. Each of these components can be switched on or off individually. The effect of each individual component on the conditioning of the air is as interesting as the effect of any combination of components.

Sensors record the air temperature and air humidity before and after each stage as well as the pressures and temperatures of the refrigerant. The measured values can be read on digital displays. At the same time, the measured values can also be transmitted directly to a PC via USB. The data acquisition software is included.

Learning objectives/experiments

- air conditioning of room air
  - setup of an air conditioning system: main components and their function
  - variables in air conditioning
  - measure temperature and air humidity
  - effect of the air flow
  - changes of state in the h-x diagram
- setup of a refrigeration system: main components and their function
- measurements in the refrigeration circuit
  - cyclic process in the log p-h diagram
  - determine heating and cooling capacities

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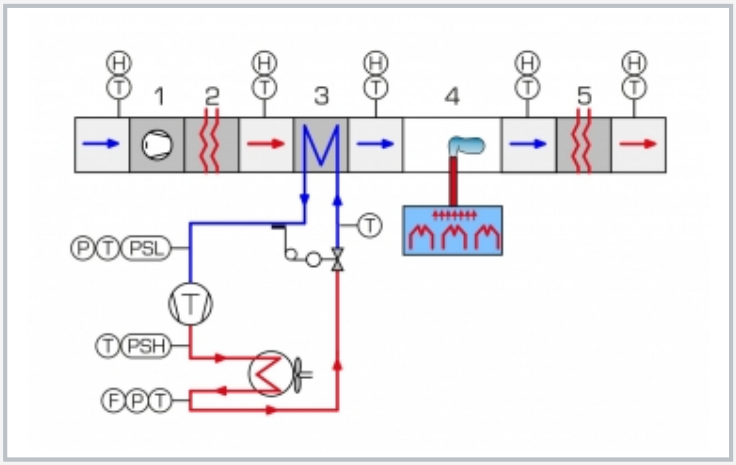
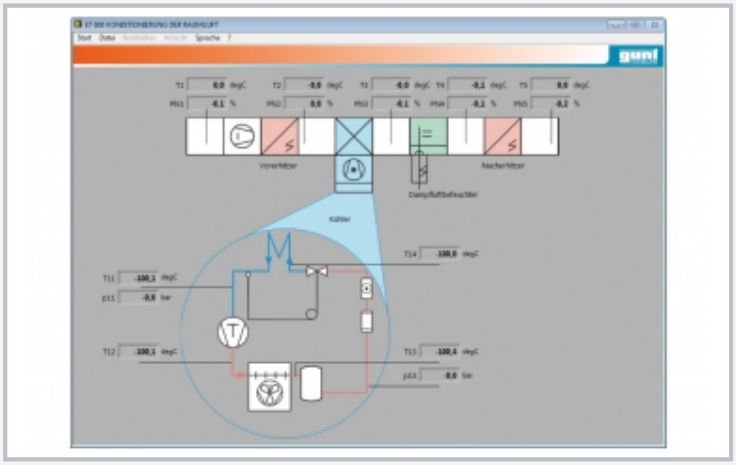
1 controls, 2 air cooler (direct evaporator), 3 fan, 4 air preheater, 5 temperature sensor, 6 condensing unit, 7 air humidifier, 8 air reheater, 9 air duct, 10 inclined tube manometer, 11 displays



Setup of the air conditioning system: 1 fan, 2 air preheater, 3 air cooler, 4 air humidifier, 5 air reheater; sensors: H humidity, T temperature, P pression, F flow



Software screenshot: process schematic

Specification

[1] effect of typical air conditioning system components on the conditioning of room air
[2] air conditioning system with open air duct
[3] air conditioning system with air cooler, steam humidifier, fan, air preheaters and reheaters
[4] all components can be switched on and off individually
[5] determination of the volumetric air flow rate by differential pressure measurement using an inclined tube manometer
[6] combined sensors for the air humidity and temperature before and after each stage
[7] sensor for the pressure and temperature of the refrigerant
[8] GUNT software for data acquisition via USB under Windows 7, 8.1, 10
[9] software with representation in the log p-h and h-x diagram
[10] refrigerant R134a, CFC-free

Technical data

Steam humidifier
- power consumption: 4kW
- steam capacity: 5,5kg/h, switchable in three stages

Fan
- power consumption: 167W
- max. volumetric flow rate: 1150m^3/h
- speed: 1000...2600min^{-1}
- Δp_{max}: 460Pa

Air preheater: 1kW, switchable in two stages
Air reheater: 2kW, switchable in two stages
Air duct, WxH: 300x350mm
Direct evaporator as air cooler: 6kW
Condensing unit
- power consumption: 968W at 5/25°C
- refrigeration capacity: 2,3kW at 5/25°C

Measuring ranges
- differential pressure: 0...100Pa
- temperature: 5x 0...50°C, 4x -100...200°C
- humidity: 5x 10...90%
- pressure: 1x -1...15bar, 1x -1...24bar (refrigerant)
- flow rate: 8...102L/h (refrigerant)

400V, 50Hz, 3 phases
400V, 60Hz, 3 phases; 230V, 60Hz, 3 phases
LxWxH: 2570x790x1750mm
Weight: approx. 330kg

Required for operation

water connection, drain
PC with Windows recommended

Scope of delivery

1 trainer, filled with refrigerant
1 GUNT software CD + USB cable
1 set of instructional material