

WL 201

Fundamentals of humidity measurement



Description

- different measuring methods for measuring humidity
- climatic chamber with adjustable humidity and transparent door

The measurement of air humidity plays an important role in many branches of industry, e.g. during drying or in the air conditioning of buildings and vehicles. There are different measuring methods to determine humidity.

The trainer WL 201 enables the measurement of air humidity with four different instruments which can be directly compared to each other: two different hygrometers, a capacitive hygrometer and a psychrometer.

Psychrometers operate based on the principle of evaporation cooling and compare the ambient temperature with the wet bulb temperature to determine the humidity. Hygrometers utilise the property of specific fibres, e.g. hair, to expand with increasing air humidity. In the capacitive sensor the dielectricity constant of a layer and with it its capacity changes due to the water molecules absorbed.

The core element of the trainer is a climatic chamber with transparent door. This chamber can be humidified and dehumidified and contains the four instruments. A Peltier cooling element is used for dehumidification. An ultrasonic atomiser is used for humidification. To circulate the air and ensure good mixing a fan is used.

Learning objectives/experiments

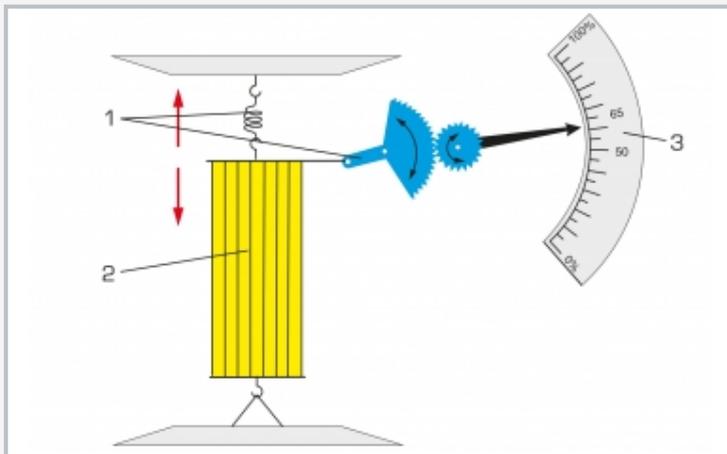
- measuring methods for air humidity measurement
 - ▶ psychrometric humidity measurement
 - ▶ hygrometric humidity measurement
 - ▶ capacitive humidity measurement
- characteristic variables to describe air humidity
- changes of the state of humid air in the h-x diagram
- determination of the relative air humidity with
 - ▶ psychrometer
 - ▶ hair hygrometer
 - ▶ hygrometer with synthetic fibre
 - ▶ capacitive humidity sensor
- design and operation of the instruments
- comparison of the instruments

WL 201

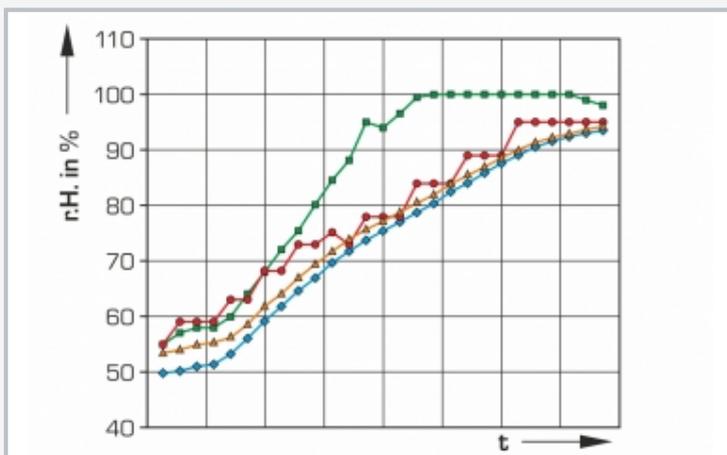
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1 capacitive humidity sensor, 2 displays and controls, 3 humidifier, 4 psychrometer, 5 hair hygrometer, 6 dehumidifier, 7 hygrometer with synthetic fibre and combined temperature sensor



Principle of the hair hygrometer: 1 mechanism to measure the humidity-dependent change in length of the hair bundle, 2 hair bundle, 3 humidity scale



Relative humidity (r. h.) over time (t) with rising content of humidity; blue: capacitive sensor, orange: hygrometer with synthetic fibre, red: psychrometer, green: hair hygrometer

Specification

- [1] different measuring methods for measuring humidity
- [2] climatic chamber with adjustable humidity and transparent door
- [3] humidification via ultrasonic atomiser
- [4] dehumidification via Peltier cooling element
- [5] fan for air recirculation
- [6] 2 mechanical instruments: psychrometer, hair hygrometer
- [7] 2 electronic instruments: capacitive sensor, hygrometer with synthetic fibre and combined temperature sensor

Technical data

Humidifier

- ultrasonic atomiser
- power consumption: 21,6W
- low water cut-off

Dehumidifier

- Peltier element
 - ▶ cooling capacity: 56,6W (50°C ambient temperature)
 - ▶ cooling surface: 1600mm²

Hair hygrometer with deflective needle

- measuring range: 0...100% r. h.

Hygrometer with synthetic fibre

- output voltage: 0...10V
- measuring ranges: 0...100% r. h. / -30...80°C

Capacitive sensor with digital display

- output voltage: 0...10V
- measuring range: 1...100% r. h.

Psychrometer with thermometer

- measuring range: -10...60°C, graduation: 0,5°C

230V, 50Hz, 1 phase

120V, 60Hz, 1 phase; 230V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1400x800x1630mm

Weight: approx. 110kg

Scope of delivery

- 1 trainer
- 1 psychrometer
- 2 hygrometers
- 1 set of instructional material