AIR HUMIDITY MEASUREMENT

DL HC-AHM

INTRODUCTION

The basic humidity measurement trainer is a training and teaching system designed for comparative study and instruction of fundamental humidity measurement principles. The core function of the platform is to simulate atmospheric humidity variations through electrically controlled humidification and dehumidification components.

Humidity changes within the simulated laboratory environment are measured using four hygrometers based on different operating principles, including a hair hygrometer, a fiber hygrometer, a capacitive hygrometer, and a dry- and wet-bulb hygrometer. The fiber hygrometer determines air humidity based on the hygroscopic characteristics of the fiber material. The capacitive hygrometer measures humidity by detecting changes in environmental capacitance caused by variations in water molecule content. The dry- and wet-bulb hygrometer determines air humidity using the evaporation principle, based on the ambient temperature and wet-bulb temperature parameters.

A cooling element combined with a humidifying module is used to simulate laboratory dehumidification and humidification processes, while an integrated fan ensures uniform air mixing within the chamber. Through a series of structured experimental exercises, the platform enables students to understand the working principles of basic hygrometers and to develop relevant technical knowledge, practical skills, and innovation capabilities.

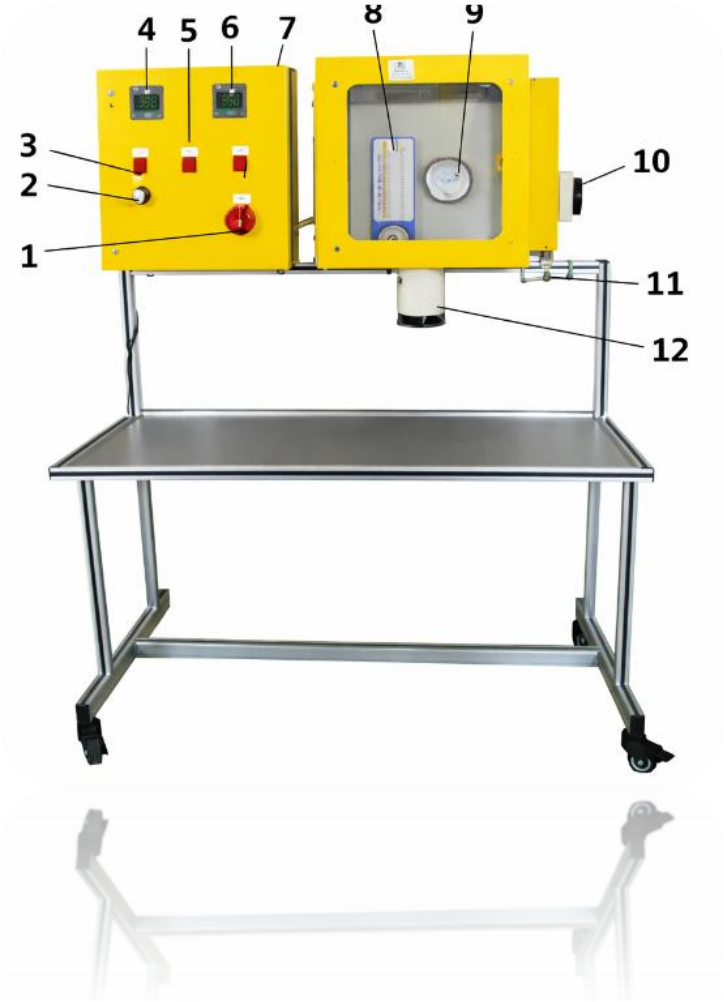
FLUID MECHANICS

The test bench includes a simulated laboratory chamber capable of reproducing atmospheric humidity variations, with quantitative humidity adjustment achieved through a cooling element and a humidifier. Four hygrometers based on different measurement principles are integrated into the experimental platform. An internal fan is provided to ensure uniform air circulation and consistent environmental conditions, The simulated laboratory is equipped with a fully transparent observation window, allowing clear visualization of the experimental process and environmental changes.

No.	Name	Function
1	Humidifier	Power 21.6W, Rotating speed 500-3300min^{-1}
2	Bolt element cooling element	Power 56.6W, Cooling area 1600mm^2
3	Fiber Hygrometer	Voltage 0-10V, Measuring range 0-100% Relative Humidity -30-80℃
4	Capacitive Hygrometer	Voltage 0-10V Measuring range 1-100% Relative humidity
5	Psychrometer	Scale 0.5℃, Temperature range -10-60℃, Measuring range 1-100% Relative humidity Voltage frequency 230V, 50Hz, Single phase
6	Size parameters	Length x width x height 1400x800x1630mm Weight Approx 110kg

Component Identification

1. Main power switch.
2. Airflow adjustment control knob.
3. Circulation fan control switch.
4. Temperature and humidity meter A.
5. Instrument power switch.
6. Temperature and humidity meter B.
7. Refrigeration unit control switch.
8. Wet- and dry-bulb thermometer.
9. Hair hygrometer.
10. Refrigeration unit.
11. Condensate collection box.
12. Humidifier.



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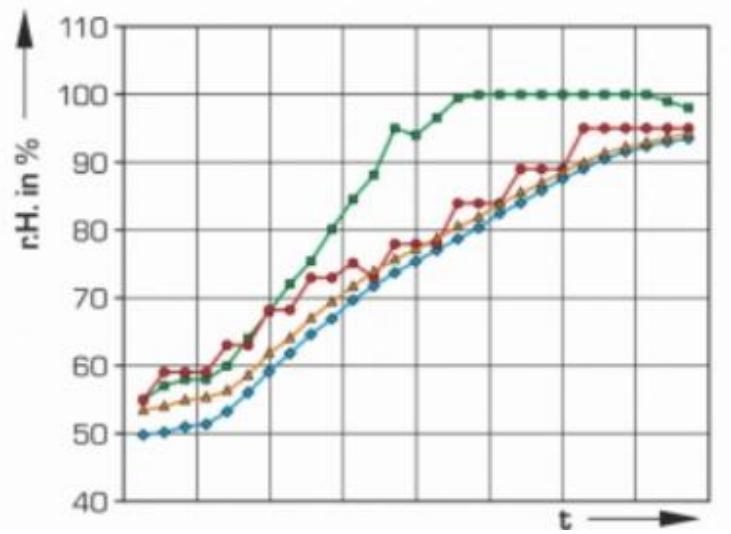
Relative humidity (rH, vertical axis) as a function of time (t, horizontal axis).



Blue curve: capacitive hygrometer;
Orange curve: fiber hygrometer;
Red curve: dry- and wet-bulb hygrometer;
Green curve: combined fiber hygrometer.

Experiments

- Comparative analysis of atmospheric humidity measurements using different hygrometers.