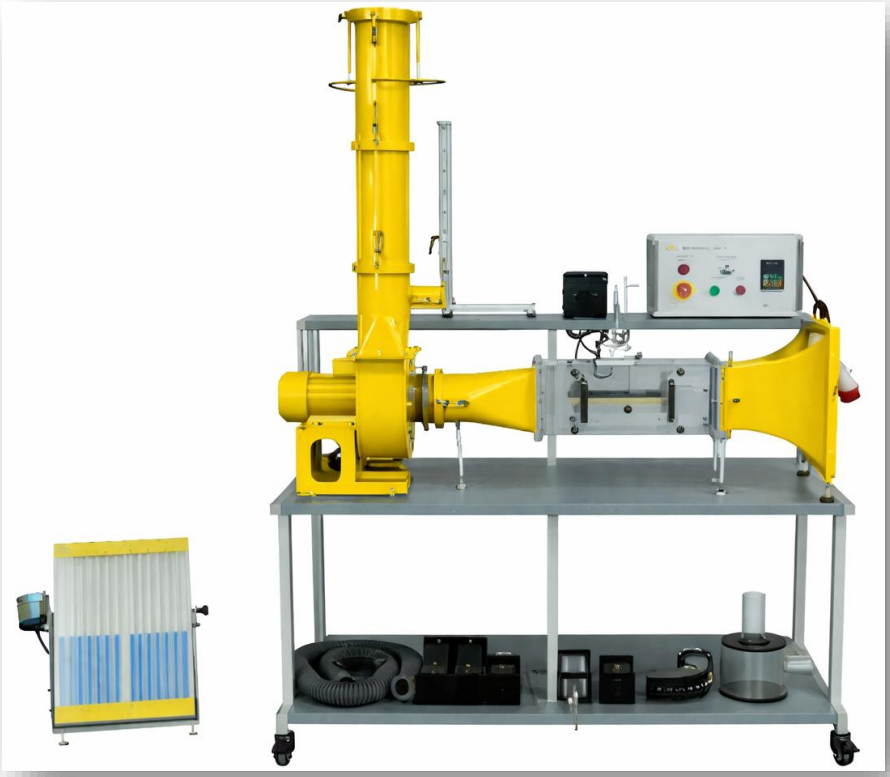
# FLUID MECHANICS

## AIR FLOW TRAINING UNIT



## DL HC-AFT

**INTRODUCTION**

The airflow trainer is an experimental device designed for the study and demonstration of aerodynamic principles, particularly those related to low-speed and viscous aerodynamics. The system consists of two primary components: a main unit, responsible for generating and controlling the high-velocity airflow required for experimental analysis, and an accessory module, which enables the execution and validation of a wide range of aerodynamic experiments. This equipment provides an effective experimental platform for the analysis, visualization, and verification of fundamental aerodynamic concepts.

The device features a safe and robust electrical design, ensuring reliable grounding performance and high operational safety.

- An integrated electrical architecture enables clear visualization of sensor data through a smart display interface, allowing efficient monitoring and convenient data processing.
- A comprehensive range of experimental accessories supports a wide variety of experimental configurations, significantly expanding experimental capabilities.
- Constructed from high-strength, corrosion-resistant materials, the equipment offers enhanced safety, improved durability, and an extended service life.
- Input Power Supply: Three-phase five-wire system, 50/60 Hz.
- Overall Dimensions: 1530 mm × 780 mm × 1450 mm, weight: 300 kg aprox.
- Operating Conditions: Ambient temperature: −10 °C to +40 °C, Relative humidity: < 85% at 25 °C.

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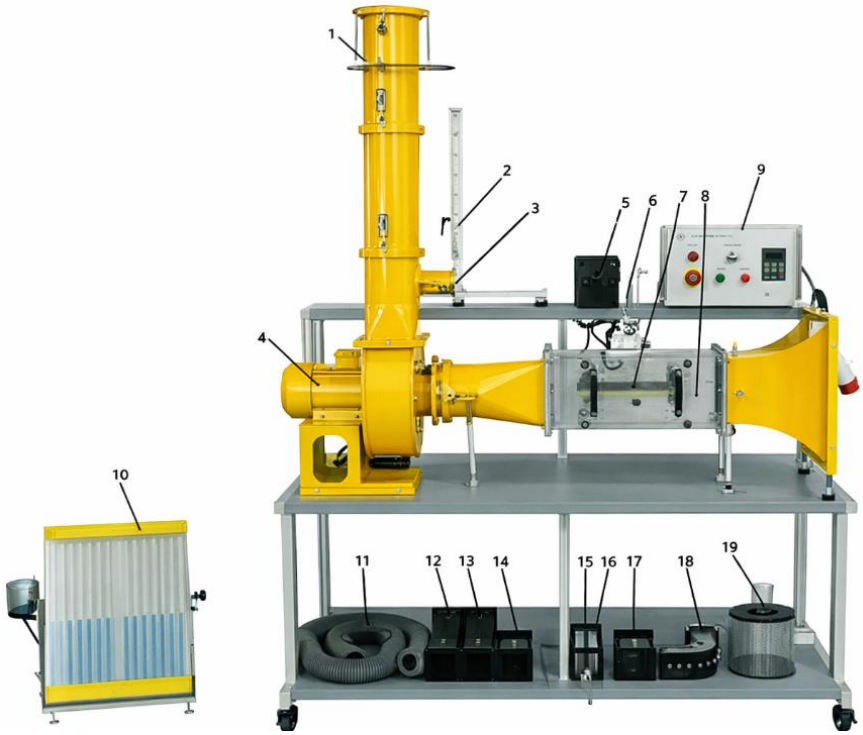


| No. | Name | Function |
|---|---|---|
| 1 | Measuring hole | Hole for connecting measuring device |
| 2 | Clamping table with adjustable scale | Adjustable pitot tube holding device |
| 3 | Pipe outlet | For connecting large diameter hose |
| 4 | Variable frequency fan | Power used to drive air flow in experimental ducts |
| 5 | smoke generator | Pipes used to indicate how fluid flows through an experiment |
| 6 | Displacement measuring instrument | Used to measure the thickness of the velocity boundary layer |
| 7 | Velocity Boundary Layer Measurement Plate | Plate to be tested for velocity boundary layer measurements |
| 8 | Transparent experimental section | Visual experimental space for conducting experiments |
| 9 | Electrical control unit | Electrical device for control device |
| 10 | Multi-tube hydraulic column differential pressure gauge | Liquid column differential pressure gauge for measuring multiple tubes |
| 11 | Large diameter experimental hose | Hose for connecting experimental modules |
| 12 | Venturi Pipe Model A | Experimental accessory |
| 13 | Venturi Pipe Model B | Experimental accessory |
| 14 | Pipe model with large orifice plate | Used for pressure difference experiments on large orifice plate |
| 15 | Transverse pitot tube | Device for measuring total pressure |
| 16 | Transparent experimental tube with converging, throat and diverging sections | Transparent experimental tube for measuring convergence, throat and divergence section |
| 17 | Pipe model with small orifice plate | Used for pressure difference experiments on small orifice plate |

| | | |
|---|---|---|
| **18** | Right-angled square experimental pipe | Used to measure pressure difference changes in right-angled square pipe |
| **19** | Jet dispersion experiment module | Used to measure the loss along the path after diameter change |

## INCLUDED ACCESSORIES

- **Smoke oil, Smoke generator, Adapter, Experimental pipeline, Experimental hose and 4-6mm.**
- **Variable frequency fan**
  The input power supply is three-phase five-wire AC220V to drive the flow of air in the air duct.
- **Clamping table with adjustable scale**
  Movable range is 0-50cm, for holding straight pitot tubes.
- **Displacement measuring instrument**
  Measurable range is 0-10mm, used to measure boundary layer thickness.
- **Velocity boundary layer measurement plate**
  Size is 250mm x 180mm; two different roughness panels, to measure the velocity boundary layer thickness of the plate.
- **Multi-tube liquid column differential pressure meter**
  Measuring range is 0-400mm, used to measure pressure difference changes.
- **Venturi Pipe A Model**
  The narrowest point of convergence is 35mm, to explore the relationship between flow pressure difference and flow shape.
- **Venturi Pipe B Model**
  The narrowest point of convergence is 44mm, to explore the relationship between flow pressure difference and flow shape.
- **Pipe model with large orifice plate**
  The diameter of the circular hole that allows air circulation is 30mm to explore the relationship between flow pressure loss and pore size.
- **Transverse pitot tube**
  Outer diameter 4mm, length 400mm, to measure experimental pressure difference.
- **Transparent experimental pipe with convergence, throat and divergence parts**
  Provide a visual experimental device that can fix the transverse pitot tube, for flow visualization and changes in pressure differential as the flow pattern changes.
- **Pipe model with small orifice plate**
  The diameter of the circular hole that allows air circulation is 20mm, to explore the relationship between flow pressure loss and pore size.
- **Right-angled square experimental pipe**
  The length and width of the experimental channel are 60mm x 50mm, for pressure difference measurement experiments of flow around bends.
- **Jet dispersion experiment module**
  The circumferential inner diameter of the experimental device is 150mm.
- **Circuit breaker**
  The maximum allowed current is 16A, to control the on/off of circuits.

- **Inverter**
  The output power supply is three-phase AC220V; the power is 2.2kw, to control variable frequency motors.
- **Six-hole socket**
  Output AC110V power supply, to provide power to other electrical equipment.

**TRAINING OBJECTIVES**

The airflow trainer supports a total of 8 experimental practices designed to demonstrate fundamental principles of fluid mechanics and airflow behavior. These practices allow users to observe, measure, and analyze key parameters such as pressure distribution, velocity profiles, and flow patterns under different operating conditions.

Experimental practices:

- The electrical control operation of the airflow trainer.
- Measurement of velocity boundary layer thickness using the airflow trainer.
- The measurement of pressure differences in different pipe sections using the airflow trainer.
- The measurement of pressure differences in Venturi tubes with different pipe diameters using the airflow trainer.
- The measurement of pressure differences for flow around a bend using the airflow trainer.
- The Bernoulli principle experiment conducted with the airflow trainer.
- The measurement of pressure differences across different orifice plate pipes using the airflow trainer.
- The use and flow pattern visualization of the airflow trainer's smoke generator.