

HM 170

Open wind tunnel



Description

- open wind tunnel for a variety of aerodynamic experiments
- homogeneous flow through the flow straightener and special nozzle contour
- transparent measuring section

A wind tunnel is the classic experiment system for aerodynamic flow experiments. The model being studied remains at rest while the flow medium is set in motion, and thus the desired flow around the model is generated.

HM 170 is an "Eiffel" type open wind tunnel used to demonstrate and measure the aerodynamic properties of various models. For this purpose, air is drawn in from the environment and accelerated. The air flows around a model, such as an aerofoil, in a measuring section. The air is then decelerated in a diffuser and pumped back into the open by a fan.

The carefully designed nozzle contour and a flow straightener ensure a uniform velocity distribution with little turbulence in the closed measuring section. The flow cross-section of the measuring section is square.

The built-in axial fan with outlet guide vane system and a variable-speed drive is characterised by an energy-efficient operation at high efficiency. Air velocities of up to 28m/s can be reached in this open wind tunnel. The trainer is equipped with an electronic two-component force sensor. Lift and drag are detected and displayed digitally. The air velocity in the measuring section is displayed on the inclined tube manometer. The tube manometers HM 170.50 or the electronic pressure measurement HM 170.55 are recommended for measuring the pressure distribution on bodies.

By using the system for data acquisition HM 170.60, the measured values for velocity, forces, moment, displacement/angle, and differential pressure can be transferred to a PC where they can be analysed with the software.

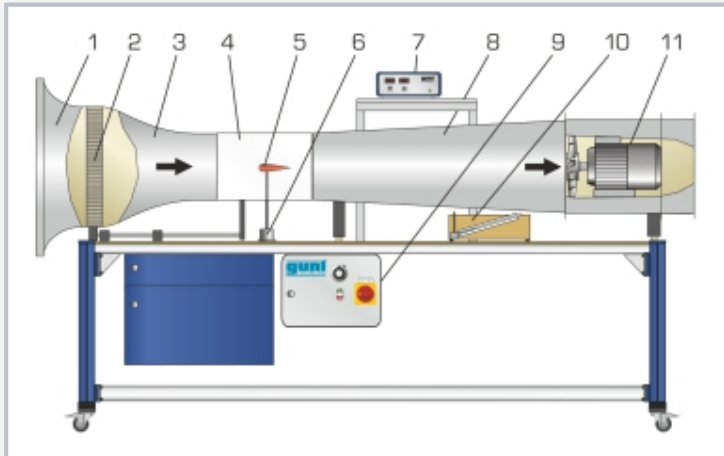
Extensive accessories allow a variety of experiments, for example lift measurements, pressure distributions, boundary layer analysis or visualisation of streamlines.

Learning objectives/experiments

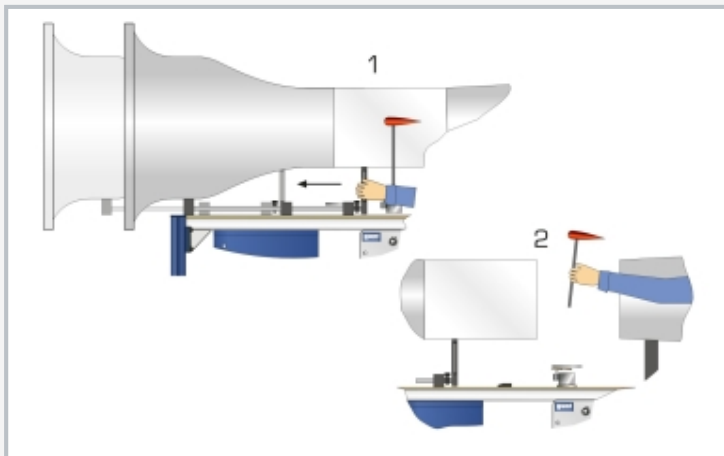
- experiments with accessories
 - ▶ determine drag and lift coefficients for different models
 - ▶ pressure distribution on bodies immersed in a flow
 - ▶ boundary layer analysis
 - ▶ investigation of flutter
 - ▶ wake measurement
- in conjunction with the fog generator HM 170.52
 - ▶ visualisation of streamlines

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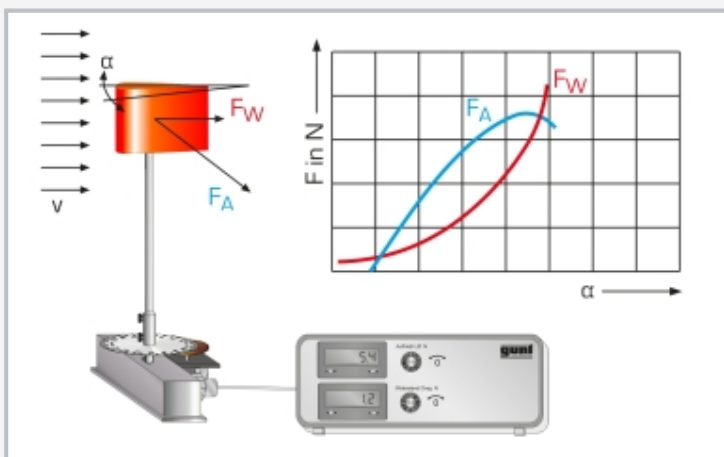
Open wind tunnel



1 inlet contour, 2 flow straightener, 3 nozzle, 4 measuring section, 5 model (HM 170.08), 6 force sensor, 7 display and control unit, 8 diffuser, 9 switch cabinet, 10 inclined tube manometer, 11 axial fan



Simple exchange of models: step 1 open lock and slide back measuring section, step 2 remove model (HM 170.08)



Together with HM 170.40 Three-component force sensor: measurement of lift and drag on an aerfoil (HM 170.09) as a function of angle of attack
blue: lift force F_A , red: drag F_W , α angle of attack

Specification

- [1] experiments from the field of aerodynamics and fluid mechanics with an "Eiffel" type wind tunnel
- [2] wide range of accessories available
- [3] transparent, closed measuring section
- [4] inlet contour, nozzle and diffuser made of GRP
- [5] variable-speed fan motor for energy-efficient operation
- [6] flow straightener reduces turbulence
- [7] inclined tube manometer for displaying the air velocity
- [8] electronic two-component force sensor for measuring the drag and lift forces
- [9] digital display of drag and lift on the measuring amplifier
- [10] angle display on a scale
- [11] optional: display of measured values for velocity, forces, moment, displacement/angle, and differential pressure using system for data acquisition HM 170.60

Technical data

Measuring section

- flow cross-section $W \times H$: 292x292mm
- length: 420mm
- wind velocity: 1,3...25m/s

Axial fan

- power consumption: 3,4kW

Measuring ranges

- force:
 - ▶ lift: $\pm 4\text{N}$
 - ▶ drag: $\pm 4\text{N}$
- velocity: 1,3...25m/s
- angle: $\pm 180^\circ$

230V, 50Hz, 1 phase

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

UL/CSA optional

LxWxH: 2870x890x1540mm

Weight: approx. 250kg

Scope of delivery

- 1 trainer
- 1 set of instructional material

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Optional accessories

Drag body

HM 170.01	Drag body sphere
HM 170.02	Drag body hemisphere
HM 170.03	Drag body circular disc
HM 170.04	Drag body circular ring
HM 170.05	Drag body square plate
HM 170.07	Drag body cylinder
HM 170.08	Drag body streamline body
HM 170.10	Drag body paraboloid
HM 170.11	Drag body concave shape

Lift body

HM 170.06	Lift body flag
HM 170.09	Lift body aerofoil NACA 0015
HM 170.12	Lift body square plate
HM 170.13	Lift body aerofoil NACA 54118
HM 170.14	Lift body aerofoil NACA 4415
HM 170.21	Aerofoil with slat and slot flap
HM 170.52	Fog generator

Pressure distribution

HM 170.22	Pressure distribution on an aerofoil NACA 0015
HM 170.26	Pressure distribution on an aerofoil NACA 54118
HM 170.27	Pressure distribution on an aerofoil NACA 4415
HM 170.23	Pressure distribution on a cylinder

Other experiments

HM 170.20	Aerofoil, spring-mounted
HM 170.24	Boundary layer analysis with Pitot tube
HM 170.25	Model "Bernoulli"
HM 170.28	Wake measurement
HM 170.70	Wind power plant with rotor blade adjustment

Measuring instruments

HM 170.31	Pitot tube
HM 170.32	Pitot tube, small
HM 170.33	Pitotstatic tube
HM 170.40	Three-component force sensor
HM 170.50	16 tube manometers, 600mm
HM 170.55	Electronic pressure measurement for HM 170
HM 170.53	Differential pressure manometer
HM 170.60	System for data acquisition
HM 170.61	Electronic displacement measurement