

# 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.

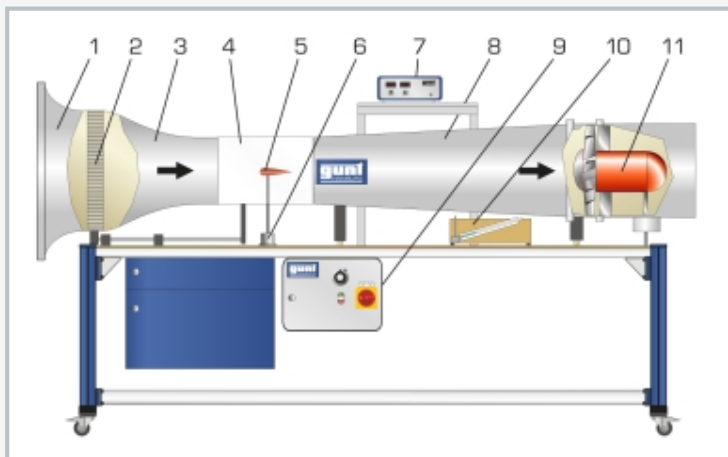
Extensive accessories allow a variety of experiments, for example lift measurements, pressure distributions, boundary layer analysis or visualisation of streamlines.

### Learning objectives/experiments

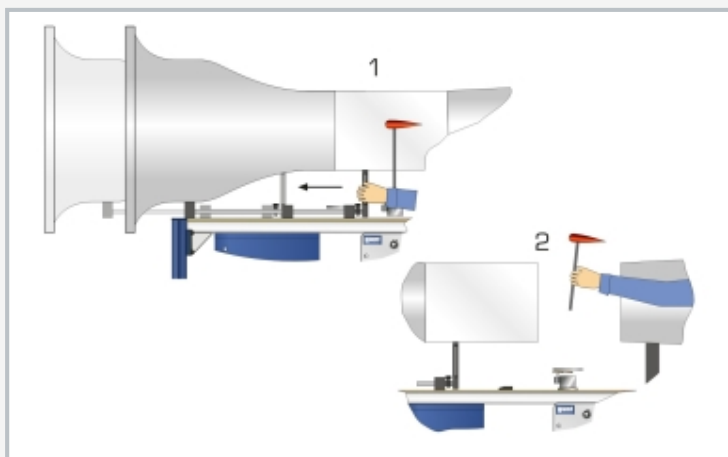
- experiments with accessories
  - ▶ determine drag and lift coefficients for different models
  - ▶ pressure distribution on bodies immersed in a flow
  - ▶ boundary layer analysis
  - ▶ investigation of flutter
  - ▶ wake measurement
- in conjunction with the fog generator HM 170.52
  - ▶ visualisation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

# HM 170

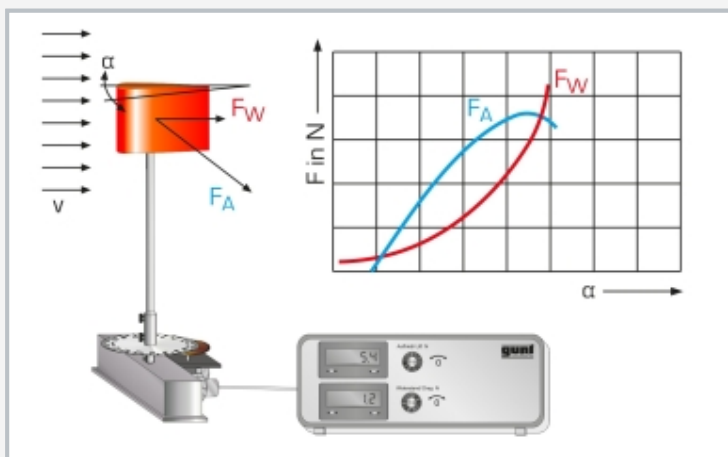
## Open wind tunnel



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 aerofoil (HM 170.09) as a function of angle of attack  
blue: lift force  $F_A$ , red: drag  $F_W$ ,  $\alpha$  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 WxH: 292x292mm
- length: 420mm
- wind velocity: 3,1...28m/s

#### Axial fan

- power consumption: 2,2kW

#### Measuring ranges

- force:
  - ▶ lift:  $\pm 4\text{N}$
  - ▶ drag:  $\pm 4\text{N}$
- velocity: 3,1...28m/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

# HM 170

## Open wind tunnel

### Optional accessories

#### Drag body

070.17001	HM 170.01	Drag body sphere
070.17002	HM 170.02	Drag body hemisphere
070.17003	HM 170.03	Drag body circular disc
070.17004	HM 170.04	Drag body circular ring
070.17005	HM 170.05	Drag body square plate
070.17007	HM 170.07	Drag body cylinder
070.17008	HM 170.08	Drag body streamline body
070.17010	HM 170.10	Drag body paraboloid
070.17011	HM 170.11	Drag body concave shape

#### Lift body

070.17006	HM 170.06	Lift body flag
070.17009	HM 170.09	Lift body aerofoil NACA 0015
070.17012	HM 170.12	Lift body square plate
070.17013	HM 170.13	Lift body aerofoil NACA 54118
070.17014	HM 170.14	Lift body aerofoil NACA 4415
070.17021	HM 170.21	Aerofoil with slat and slot flap
070.17052	HM 170.52	Fog generator

#### Pressure distribution

070.17022	HM 170.22	Pressure distribution on an aerofoil NACA 0015
070.17026	HM 170.26	Pressure distribution on an aerofoil NACA 54118
070.17027	HM 170.27	Pressure distribution on an aerofoil NACA 4415
070.17023	HM 170.23	Pressure distribution on a cylinder

#### Other experiments

070.17020	HM 170.20	Aerofoil, spring-mounted
070.17024	HM 170.24	Boundary layer analysis with Pitot tube
070.17025	HM 170.25	Model "Bernoulli"
070.17028	HM 170.28	Wake measurement
070.17070	HM 170.70	Wind power plant with rotor blade adjustment

#### Measuring instruments

070.17031	HM 170.31	Pitot tube
070.17032	HM 170.32	Pitot tube, small
070.17033	HM 170.33	Pitotstatic tube
070.17040	HM 170.40	Three-component force sensor
070.17050	HM 170.50	16 tube manometers, 600mm
070.17055	HM 170.55	Electronic pressure measurement for HM 170
070.17053	HM 170.53	Differential pressure manometer
070.17060	HM 170.60	System for data acquisition
070.17061	HM 170.61	Electronic displacement measurement