

HM 215

Two-stage axial fan



Description

- two axial fans in series configuration or in individual operation
- three-hole probe for determining pressure and velocity profile

Axial fans are connected in series in plants to increase the pressure. In theory, connecting two fans in series doubles the pressure increase.

The HM 215 trainer allows the investigation of a two-stage axial fan. A measuring device is used to determine the pressure and velocity distribution.

The trainer includes a measuring section with two identical axial fans. The carefully designed nozzle contour and a flow straightener at the air inlet ensure a uniform velocity distribution with little turbulence in the measuring section. The rotors are equipped with individually adjustable blades to change the angle of attack. The fans are equipped with outlet guide vane systems. These guide mechanisms redirect the angular momentum of the outflow in the axial direction and

allow an increase in pressure. A pipe bend may optionally be installed to rotate the flow at the outlet of the measuring section. One of the fans can be removed from the measuring section so that the remaining fan can be studied in individual operation.

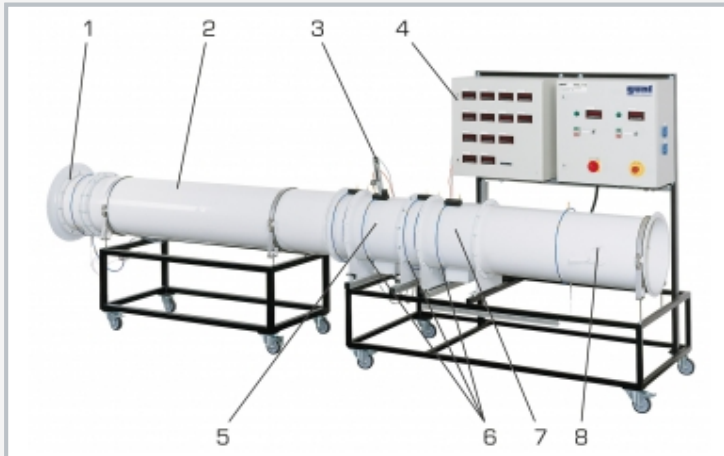
In the measuring section there are measuring connections to detect the differential pressures and temperatures. The flow rate is measured via an inlet nozzle. The differential pressure and the angle of attack are detected radially at rotors and guide vane systems by means of the 3-hole probe. This enables the display of different pressure and velocity profiles. The measured values are read from digital displays and can at the same time be transmitted via USB directly to a PC where they can be analysed using the software included.

Learning objectives/experiments

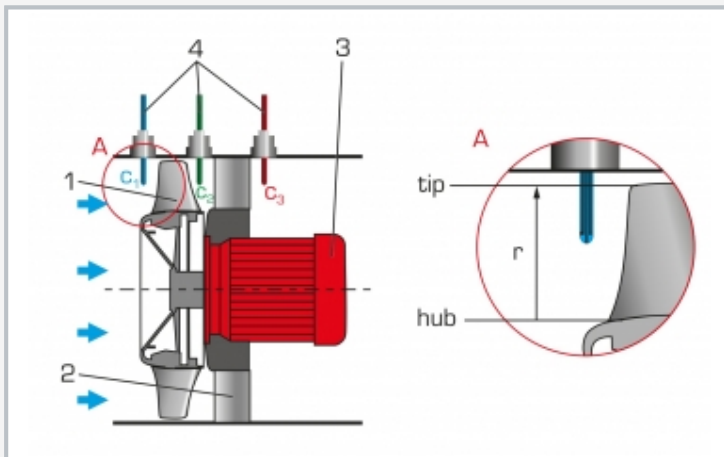
- determining the fan characteristic
- series configuration or individual operation of axial fans
- determining the energy balance
- determining the radial pressure and velocity distribution on rotor and guide vane system by means of a probe
- effect of the blade position

HM 215

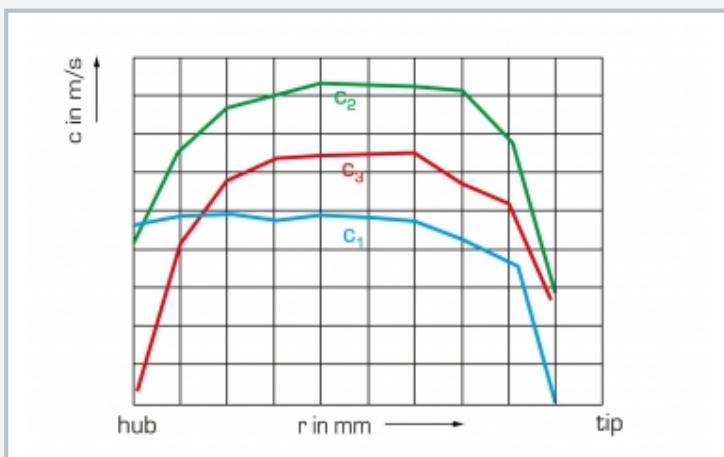
Two-stage axial fan



1 nozzle with flow straightener, 2 intake pipe, 3 measuring device, 4 switch box, 5 fan no. 1, 6 pressure measuring points, 7 fan no. 2, 8 throttle valve



Fan with measuring device
1 adjustable blade on the rotor hub, 2 guide vane system, 3 motor, 4 measuring points with 3-probe hole; c_1 to c_3 absolute velocities, r radial position of the probe



Velocity distribution along the blade in radial direction
blue: c_1 upstream of the rotor, green: c_2 downstream of the rotor, red: c_3 downstream of the guide vane system; v velocity, r radial position of the probe along the blade from hub to tip

Specification

- [1] investigate two-stage axial fan
- [2] 2 identical single-stage fans in series configuration or individual operation
- [3] individually adjustable blades
- [4] fans both with variable speed via frequency converter
- [5] flow-optimised nozzle and flow straightener for smooth, low-turbulence flow
- [6] air flow in the pipe section can be adjusted via throttle valve
- [7] optional pipe bend at the outlet for flow deflection
- [8] measuring device with three-hole probe for determining the differential pressure on rotor and guide vane system
- [9] sensors for pressure and temperature upstream and downstream of each fan
- [10] volumetric flow rate measured via inlet nozzle
- [11] GUNT software for data acquisition via USB under Windows 8.1, 10

Technical data

- 2 fans
- drive motor rated output: 3,45kW
- max. pressure difference: 798Pa
- speed: 0...2850min⁻¹
- blade angle adjustable up to 39°

Measuring section inner diameter: 400mm

Measuring ranges

- temperature: 0...100°C
- differential pressure: ±25mbar
- radial position of the probe: 100...200mm

400V, 50Hz, 3 phases

400V, 60Hz, 3 phases

LxWxH without pipe outlet: 4325x970x1800mm

Length with pipe outlet: 5225mm

Weight: approx. 250kg

Required for operation

PC with Windows recommended

Scope of delivery

- 1 trainer with 2 fans
- 1 pipe bend
- 1 measuring device
- 1 set of measuring hose with quick-release couplings
- 1 CD with GUNT software + USB cable
- 1 set of instructional material