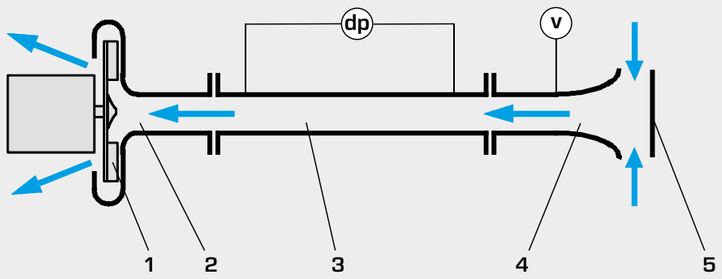
HM 230 Flow of compressible fluids

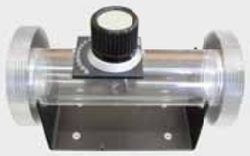


1 fan, **2** inlet, **3** interchangeable measuring object (pipe section),
4 measuring nozzle, **5** protective plate; **dp** pressure differential, **v** velocity

The basics of compressible air flow can ideally be taught with the extensive programme of HM 230. Through a variety of experiments the students acquire a broad knowledge and understanding of the flow of compressible fluids. An introduction to the topic of transonic flow is covered with a nozzle designed specifically for the supersonic range.

- complete course offers experiments on subsonic and transonic flow
- all components clearly arranged on a plate
- measuring objects made of transparent materials show the inner structure and the nozzle contour
- velocities up to Ma 1
- pressure differences in the system to 600 mbar

Measuring objects

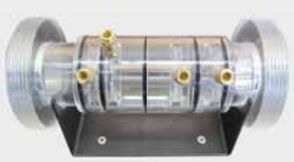


Throttle valve

Pipe bend

Pipes

Orifice



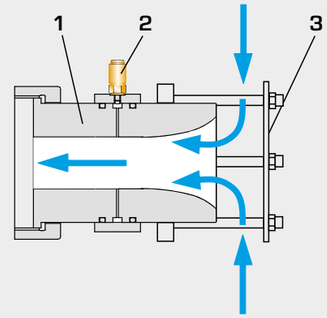
Nozzle with discontinuous enlargement

Nozzle with continuous enlargement (de Laval nozzle)

Determining the mass flow

The measuring nozzle at the air inlet is used for low-loss acceleration of the air and is placed in front of each measuring object. A protective plate prevents larger objects from being accidentally drawn in and clogging the intake.

The pressure is measured in the measuring nozzle and used to calculate the flow velocity, in order to then determine the mass flow.



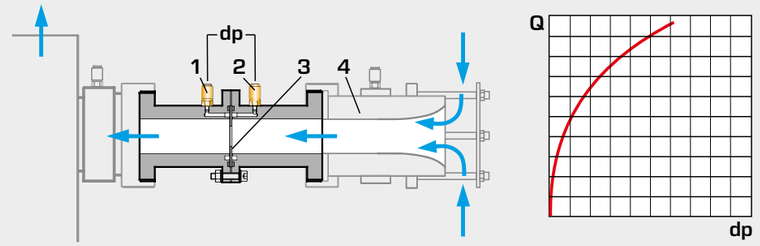
1 measuring nozzle,
2 pressure measuring point,
3 protective plate

Scope of the experiment

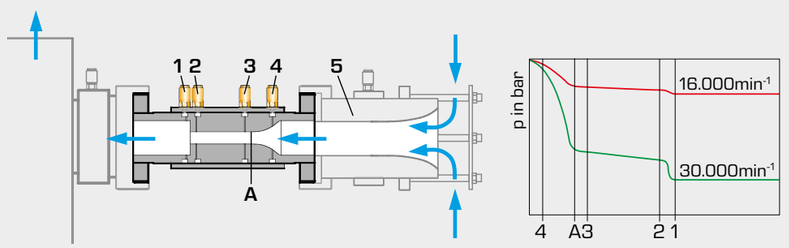
The experimental unit provides the study of pressure losses in pipe sections and in the pipe elbow, calibration of orifice plates, nozzles flows in the subsonic range and in the transonic range.

Example of an experimental set-up: record calibration curves for an orifice

- determine volumetric flow rate using differential pressure at the orifice
- comparison of two orifice disks for the measuring range 0...200 mbar and comparison of two orifice disks for the measuring range 0...1 bar
- comparison of orifice and measuring nozzle (determining the mass flow in the measuring nozzle at the air inlet is used as a reference)



1-2 pressure measuring points in front of and behind the orifice disk,
3 interchangeable orifice disk, **4** measuring nozzle;
calibration curve, **Q** mass flow, **dp** pressure differential



1-4 pressure measuring points, **5** measuring nozzle;
and pressure curves, **A** beginning of the narrowest nozzle cross-section

Example of an experimental set-up: record pressure curves in the nozzle with discontinuous extension

- pressure curve in the convergent and cylindrical part of the nozzle
- pressure loss at the discontinuous enlargement
- comparison with pressure loss in the de Laval nozzle