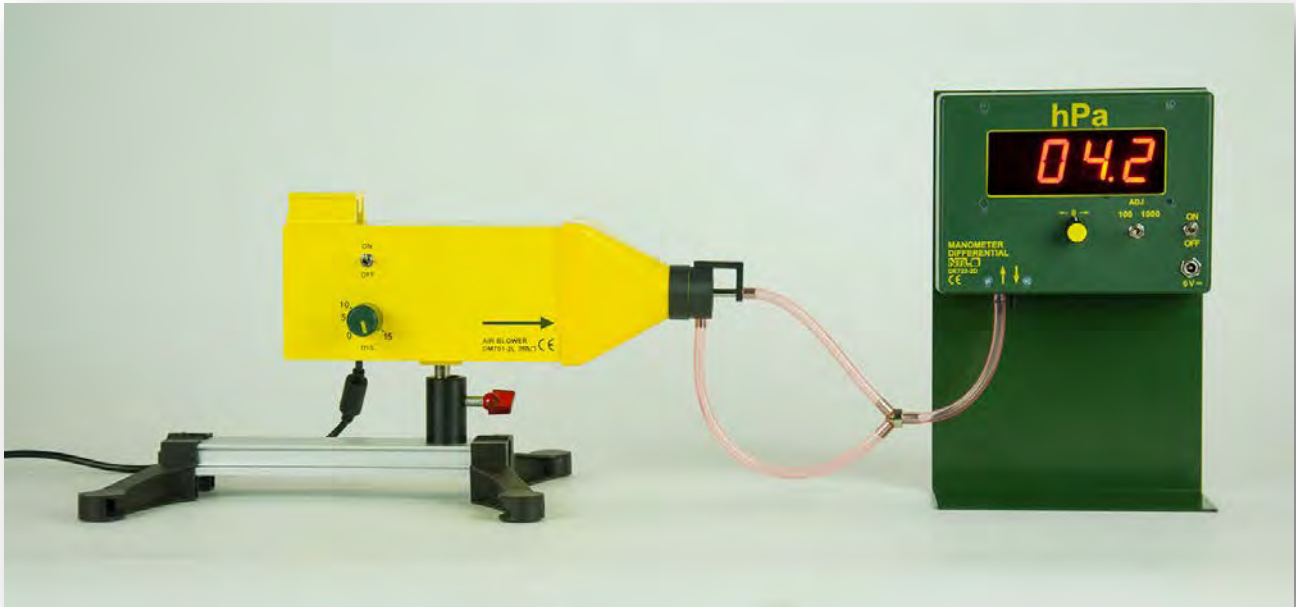


DYNAMIC PRESSURE, BERNOULLI'S EQUATION

MED 19.22



Material:

Item Code	Qty	Description
DS090-3K	1	Claw base "Sepp", 260 x 220 mm
DM701-2L	1	Blower 12 V
P3130-2Q	1	Fixed voltage transformer 12V DC/10 A
DM701-2K	1	Tube adapter for blower
DM713-1S	1	Pitot tube, apparatus set
DE722-2D	1	Manometer, differential, "inno"
P3120-4A	1	L-shaped assembly platform

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Purpose

The difference of the static pressure and the dynamic pressure is called the total pressure.

$$p_{\text{tot}} - p_{\text{stat}} = p_{\text{dyn}}$$

The dynamic pressure is measured by measuring the static pressure (lateral to the flow) and the total pressure (directly in the flow), so that only the difference between the two pressures is displayed.

Preparation

- the blower is fixed to the saddle on the support base and screwed down tightly
- the tube adapter for blower is fixed on the blower
- the Manometer is attached to the S-shaped assembly platform
- the „Y“-piece is connected to 3 silicone hoses
- two of the hoses are connected to the Pitot tube while the third hose is connected to the Manometer (inlet - arrow pointing upwards)
- the rotary knob for the flow speed of the blower is turned to the very left
- the blower is powered by a fixed voltage transformer (12 V DC, min. 6 A)

Experiment:

We select the range 100 hPa at the Manometer and adjust the displayed value to 0 with the help of the regulator.

We turn on the blower and slowly increase the flow speed.

We observe the flow speed and the measured pressure.

Dynamic pressure (p_{dyn}) at maximum flow speed: hPa

Result

The higher the flow speed the higher is also the dynamic pressure (p_{dyn}).

In a stationary, flowing, friction-free, incompressible and weightless medium (liquid or gas) Bernoulli's equation applies at every point in the flow for pressure and speed:

$$p + \frac{\rho v^2}{2} = p_0 = \text{constant} \qquad p + p_{\text{dyn}} = p_0 = \text{constant}$$

The total of static pressure and dynamic pressure is constant at every place in the flow.

Note

The measuring unit that was built in this experiment is called „Prandtl tube“

Attention

The measured pressure may deviate from theoretically calculated values since the air flow in our experiment is not ideally laminar.

We produce the air flow with a fan blade which clearly creates turbulences and whirls, which can of course affect the measured values.