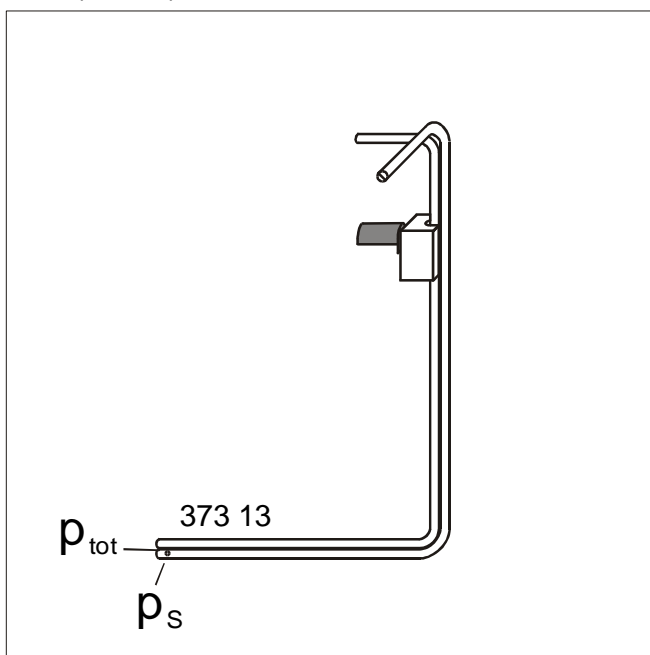


Determining the wind speed with a pressure head sensor – Measuring the pressure with a pressure sensor and Mobile-CASSY

Objects of the experiment

- To measure the total pressure
- To measure the static pressure
- To determine the wind speed

Fig. 1: Pressure head for measuring the static pressure p_s and total pressure p_{tot} .



Principles

The pressure head used in this experiment allows to measure:

P_{tot} : total pressure
(head opening positioned against the direction of flow)

and

p_s : static pressure
(head opening positioned across the direction of flow)

The pressure head can be used with the Pressure sensor S, ± 70 hPa using Mobile CASSY or Sensor CASSY (Fig. 2).

The wind velocity can be determined from a differential measuring method. The wind velocity can be read off directly from the upper scale of the fine manometer. To obtain more precise results it is recommended to calculate the wind velocity from the dynamic pressure Δp which is measured using Mobile CASSY.



$$v = \sqrt{\frac{2 \Delta p}{\rho}} \quad (I)$$

$\Delta p = P_{tot} - p_s$: dynamic pressure

ρ : density of the air

Apparatus

- 1 Suction and pressure fan..... 373 04
- 1 Pressure head 373 13
- 1 Mobile-CASSY..... 524 009
- or
- 1 Sensor CASSY 524 010USB
- or
- 1 Pocket CASSY..... 524 006
- with
- 1 CASSY Lab..... 524 200
- additionally required: 1 PC with Windows 98 or higher
- 1 Pressure sensor S, ± 70 hPa..... 524 066

- Press  key and then the left  key to display the measured pressure value.
- Read off the pressure difference at various locations s in front of the fan nozzle. The grid of the nozzle may serve as a guide for the lateral location s .
- Repeat this measurement procedure several times and calculate the mean average. It is recommended to compensate the offset before each measurement.

Note: For further hints using Mobile CASSY refer to the instruction sheet 524 009.

Measuring example

Table 1: Dynamic pressure at a distance x from the nozzle (pressure profile). s corresponds to the lateral location.








$\frac{x}{\text{cm}}$	$\frac{s}{\text{mm}}$	-50	-25	0	+25	50
5	$\frac{p}{\text{hPa}}$	70	138	150	137	65
20	$\frac{p}{\text{hPa}}$	90	146	147	145	80

Setup

Assemble the fan with the nozzle and the pressure sensor with the pressure head as shown in Fig 2. For further hints see also instruction sheets 373 04, 373 13 and 524 066.

Carrying out the experiment

Measuring with Mobile CASSY

- Switch on the Mobile CASSY with the  key.
- Call the main menu using the  key.
- Select the submenu "Quantities" by using the arrow keys  or  and enter the submenu using the right  key.
- Go to the submenu "p" using the right  key.
- Chose "Compensate Offset" and set the pressure to zero by pushing the right  key.

Evaluation and results

Table 2: Wind speed calculated with equation (I) for the pressure values of table 1. s corresponds to the lateral location.

$\frac{x}{\text{cm}}$	$\frac{s}{\text{mm}}$	-50	-25	0	+25	50
5	$\frac{v}{\text{m/s}}$	10.5	14.8	15.4	14.7	10.2
20	$\frac{v}{\text{m/s}}$	12.0	15.2	15.3	15.2	11.3

Fig. 2: Experimental setup with Mobile CASSY schematically.

