The precision manometer is a pressure-difference manometer. Together with the pressure head, it enables the measurement of static pressure, total pressure and dynamic pressure in flowing gases. A second scale permits direct reading of wind velocity when conducting measurements in air.

The dimensioning of the apparatus corresponds to the "aerodynamics" apparatus system (373 04ff).

1 Safety Instructions

⚠️ Read safety instructions!

- If correctly handled, according to the Regulation on Dangerous Substances, the manometer fluid is not classified as harmful. However, do not drink or inhale the fluid and, in the case of contact with the skin, wash off thoroughly.

- The manometer fluid is a water pollutant as defined in the Law on Water Conservation; do not discharge into the sewerage system. For disposal, refer to guidelines on the disposal of chemical residues and waste (mineral oil) (Ministry of Culture).

- Only use the enclosed manometer fluid. Calibration has been matched to this fluid.

- Handle all glass parts with great care! In particular, do not use force on the tubes and only push them a few millimetres onto the tube attachment nipple.

- Store manometer with plastic caps attached!

2.1 Precision Manometer

(1.1) Reservoir for manometer fluid

(1.2) Tube attachment nipple, diameter 8 mm, for filling manometer with manometer fluid and for connection of tube for high-pressure measurement

(1.3) Scale for reading wind velocity, 0 - 22 m/s, scale graduation 1 m/s

(1.4) Knurled nut for securing the manometer after horizontal adjustment

(1.5) Tube attachment nipple, diameter 8 mm, for attaching tubes when measuring low pressure

(1.6) Spirit level for horizontal adjustment of the manometer

(1.7) Pressure scale, 0 - 310 Pa (corresponding to 0 to 3.1 mbar), accuracy 1 Pa, scale graduation 5 Pa

On the reverse side

(1.8) Sheet metal angle for fastening the manometer to stand equipment using a Leybold multiclampl (301 01)

(1.9) Syringe with tube, for filling and emptying the reservoir (1.1)

Not shown:

- Bottle containing manometer fluid
- Plastic tube, diameter 8 mm
- 2 plastic caps for sealing the manometer

Dimensions: 49 cm x 19 cm

Weight: approx. 0.9 kg
2.2 Pressure Head (373 13)

(2.1) Total pressure head; head opening positioned against the direction of flow.

(2.2) Head for static pressure; head opening positioned across the direction of flow.

(2.3) Holder with 4-mm pin for fastening the head to the dynamometer car (from aerodynamics test accessories 1, 373 07)

Not shown:
2 plastic tubes, diameter 8 mm, for connecting the pressure head to a manometer
Dimensions: 18 cm x 13 cm x 5 cm
Weight: 0.1 kg

3 Operation

Observe safety instructions (Section 1).

3.1 Assembling and Filling the Manometer

Secure the manometer to stand equipment. Loosen knurled nut (1.4). Using the spirit level (1.6) align the manometer in an exactly horizontal position and retighten the knurled nut, without changing the setting.

Push the plunger of the syringe as far as possible and draw the manometer fluid from the bottle via the tube by pulling back the plunger.

Introduce the tube into the reservoir (1.1) and slowly fill the reservoir until the meniscus has reached the zero mark of the scales. Wait for a few seconds until the pointer has become stationary. If necessary, draw off air bubbles and, if required, fill up with some more manometer fluid or draw more off.

Important:
Before conducting measurements, moisten the capillaries with manometer fluid; to do this, tilt the manometer and then align the manometer in a horizontal position!

3.2 Measurement of High Pressure, Low Pressure and Differential Pressure

Measurement of high pressure (Fig. 3):
Connect tube to the tube attachment nipple (1.2) and connect to the gauge point of e.g. the Venturi tube (373 09).

Measurement of low pressure (Fig. 4):
Connect tube to the tube attachment nipple (1.5) and connect to the gauge point (here, the total pressure head (2.1) of the pressure head).

Measurement of differential pressure (Fig. 5):
Connect both tube attachment nipples of the precision manometer. In the example shown, tube attachment nipple (1.2) is connected to the total pressure head, tube attachment nipple (1.5) is connected to the head for static pressure. The manometer then shows the difference between total pressure and static pressure, i.e. the "dynamic pressure".

3.3 Measurement of Wind Velocity

Proceed as for the measurement of differential pressure (see Section 3.2), but either take readings from the wind velocity scale (1.3) of the precision manometer or (more precisely!) calculate the wind velocity from dynamic pressure \( \Delta p \), read from the pressure scale (1.7):

\[
v = \sqrt{\frac{2\Delta p}{\rho}}
\]

3.4 Fixing the Pressure Head Mount on the Dynamometer Car (from 373 07)

Set the 4-mm plug of the mount into the corresponding 4-mm bush of the dynamometer car (Fig. 6);
Adjust pressure head vertically by moving it in the mount.