PRESSURE = FORCE / SURFACE AREA

MED 16.01c

Material:

Item-no.	Qty.	Description
DS101-1G	1	Support base, large, L=500 mm
DS600-6G	1	Board holders, pair, magnetic
DS103-1P	1	Panel, green/white, 900x610mm
C6100-1B	1	Syringe, 100 ml, glass
C6100-5H	1	Holder for syringe 100ml, "inno"
C7445-6S	1	Hose, silicone, D=6/9 mm, L=100 cm
DS103-1W	1	Rail support "normal", short
DS504-2K	1	Sliding saddle, height adjustable
DE535-1K	1	Capacitor plate on plug
DM725-ND	1	Newtonmeter "inno" 20 N / 2000 g
DE722-2D	1	Manometer, differential, "inno"

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Purpose
Comparison of the pressure force with the pressure and the pressed area.

Preparation
- the board holders are screwed on the support base with the magnets facing to the back
- the magnetic panel is positioned slightly out of the centre on the board holders

- pull out the piston of the syringe and measure the diameter with the calliper, afterwards the area (pressure area) can be calculated

- the 100 ml glass syringe is placed in the magnetic “inno” holder
- fasten the syringe sensitively with the plastic screw

- the magnetic holder is positioned horizontally on the magnetic panel

- mount the rail support on the left board holder, afterwards fix the sliding saddle to the rail support and as close as possible to the board holder

- the height-adjustable shaft of this sliding saddle should be completely retracted

- place the Newtonmeter on the magnetic panel

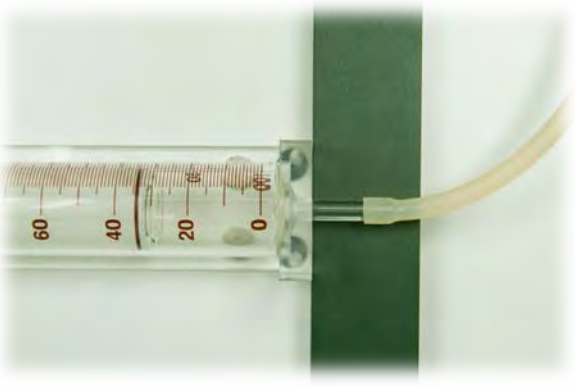
- plug the small capacitor plate is into the opening of the weighing bar

- plug the weighing bar into the shaft of the height-adjustable sliding saddle

- the piston of the glass syringe is pulled out, the pressure plate of the piston and the small capacitor plate should be as evenly as possible over another

- a 25 cm hose is connected to the syringe; it is recommended to make the end of the hose wet before attaching it so that it can be removed easier afterwards

- place the Manometer on the magnetic panel and set the measuring range to “100 hPa”



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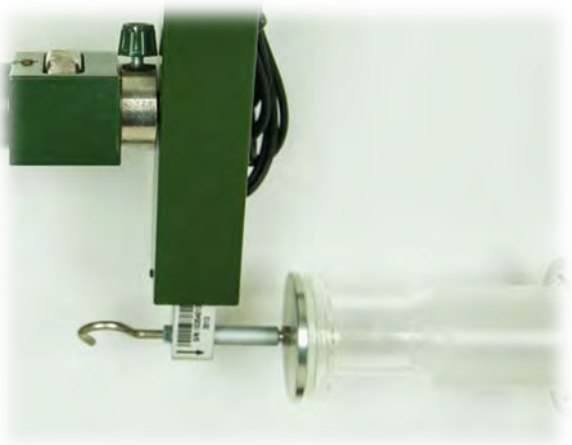
Experiment
Again, make sure that the pressure plate of the piston and the small capacitor are as evenly as possible over another.

Turn on the Newtonmeter and select the measuring range „N“, afterwards tare (set to 0).



Connect the hose of the syringe with the over pressure inlet on the Manometer.

Turn on the Manometer and tare (set to 0).

We make a few turns on the levelling screw of the sliding saddle, the shaft should move out very slowly.

As soon as Newtonmeter and the Manometer start to indicate something we stop turning the screw.

Now we tare the Newton meter and the manometer to zero once more.

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Turn the levelling screw further so that the shaft moves out further as well.
The weighing bar of the Newtonmeter is pushing on the piston plate of the syringe.

As shown on the chart below we read off

- the exact pressure force indicated on the Newtonmeter and
- the exact air pressure indicated on the Manometer

at the given pressure force.

The values are noted in the 2nd and 3rd row of the chart below.

Pressure force „F“ (target)	2 N	4 N	6 N	8 N	10 N
Pressure force „F“ (actual)	..... N	..... N	..... N	..... N	..... N
Pressure „p“ (actual)	..... hPa	..... hPa	..... hPa	..... hPa	..... hPa
Pressure „p“ (target)	..... hPa	..... hPa	..... hPa	..... hPa	..... hPa

Note
It is very difficult to set the exact value of the specified force to two decimal digits; however this is not relevant either. Therefore the force displayed should be read from the two measuring devices "by" the specified force values. The pressure display will not be stable either, so it is sufficient to read (or round to) one decimal.

We determined the pressure area of the piston when setting up the experiment.
We want to use the following formula to calculate the pressure that should "theoretically" have been the result:

$$Pressure = \frac{Force}{Area} \qquad p = \frac{F}{A} \qquad 1Pa = \frac{\mathrm{N}}{\mathrm{m}^2} \qquad 100\ hPa = \frac{\mathrm{N}}{\mathrm{cm}^2}$$

Conclusion
We have verified the above equation with this experiment.