

# Compression and Expansion of Air

## Equipment:

plexiglass cylinder with piston sealed with O-ring and with implemented thermocouple  
chart recorder  
two cables

## Chemicals:

silicone grease

## Safety:

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## Procedure:

The piston is greased with a small amount of silicone grease and then wiped off. The electric connections of the thermocouple are connected to the chart recorder using the cables. Subsequently, the zero position of the chart recorder is adjusted to the center of the paper (50 %). Then, the piston is quickly pressed into the air-filled cylinder. The piston is held down until the chart recorder deflection has returned to its original value. Subsequently, the piston is released. The measuring range of the recorder has to be chosen according to the thermocouple used, the paper advance should be about 100 mm/min.

## Observation:

The compression is characterized by an increase in temperature, the expansion, however, by a decrease in temperature.

## Explanation:

If air is compressed, the atoms become accelerated, the disorder and therefore the entropy increases and as a result the gas becomes warmer (phase 1). After a while, the gas cools down to its original value because it is not insulated from the cylinder walls and the entropy can flow out of the system into the environment (phase 2). The expansion of the piston leads to further cooling (phase 3). Then, entropy begins to flow back from the environment into the system and the gas begins to warm up (phase 4). The more slowly this is done, the more the difference between compression and expansion disappears.

## Disposal:

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