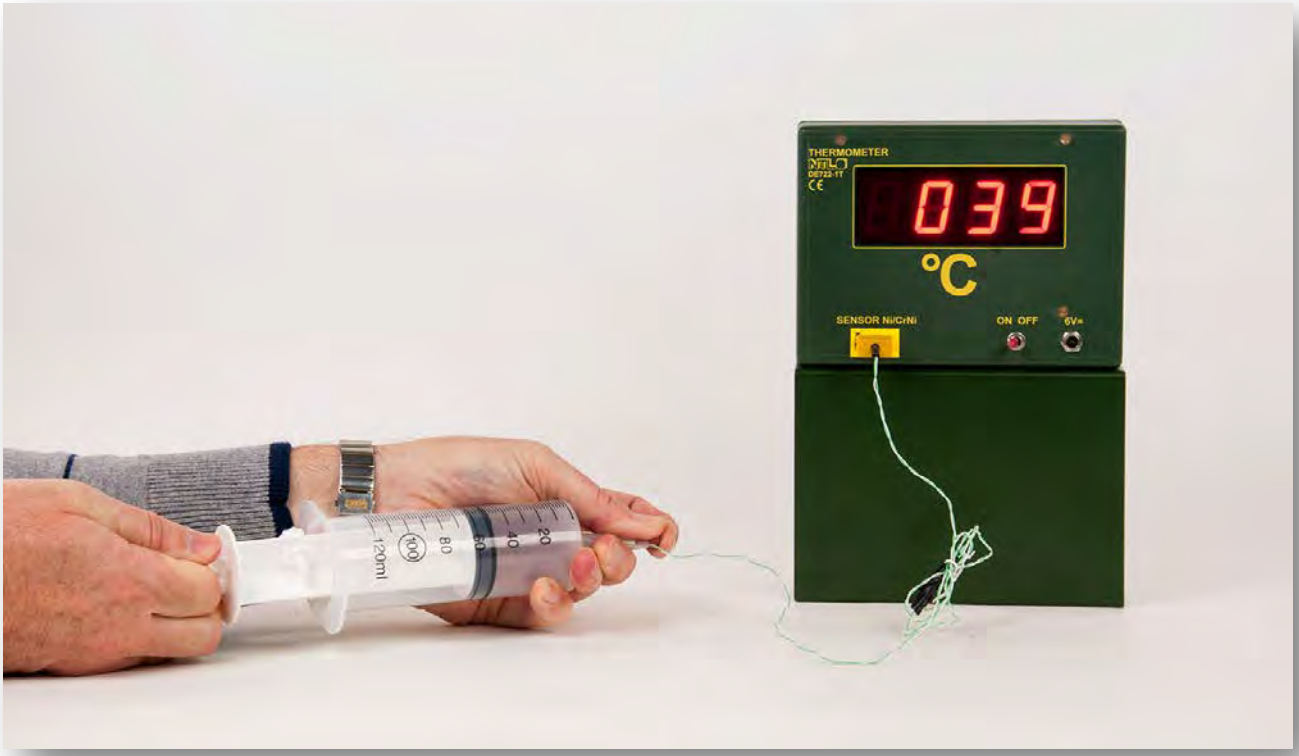
PRESSURE INCREASE - TEMPERATURE INCREASE

MED 16.05



Material:

Item-no.	Qty.	Description
C6100-2A	1	Syringe, 120ml, plastics
DE722-1T	1	Thermometer "inno", 1100 °C
P4120-1T	1	Temperature sensor (wire type), NiCrNi, -50/+300 °C
P3120-5B	1	S-shaped assembly platform
P1410-1S	1	Stopper, “mini”
Alternatively:		
C7320-6S	1	Stopper rubber, 36/44/40 mm, 1 blind hole

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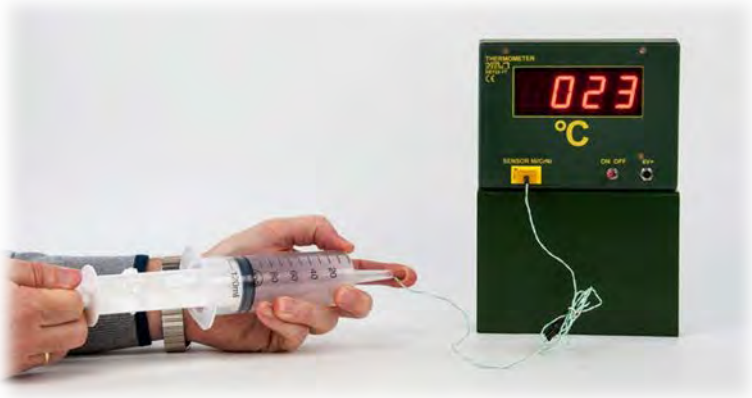
Purpose
Demonstration of temperature increase with pressure increase.

Preparation
- place the “inno” thermometer on the S-shaped assembly platform
- connect the temperature sensor to the thermometer
- insert the tip of the temperature sensor into the syringe
  (it should be between the 0 and 20 ml mark)
- push the silicone stopper in to fix the temperature sensor
  (the connection is supposed to seal as airtight as possible)

Experiment variant a)
Turn on the “inno” thermometer.
It will display the temperature inside the syringe.

Hold the syringe with one hand and press on the stopper with your index finger to seal the syringe as good as possible.



Push the piston of the syringe as strong as possible and hold the position.
Afterwards compare the indicated temperature with the initial temperature.

Result
By pushing the piston into the syringe we decrease the volume and thus increase the pressure. The higher pressure creates a higher temperature.

Attention!

The temperature that is displayed on the “inno” thermometer at the beginning may differ slightly from the actual room temperature. The tolerance of the sensor (2%) at a measuring range of 300° C can therefore lead to deviations of +/- 6 ° C.

The display of the elevated temperature is only a guide! Each temperature sensor has a response time which is usually at least several seconds. When the piston is pushed in abruptly, the air is strongly compressed for a very short time - the “temperature peak” cannot be fully absorbed by the sensor since the response time is too long.

Note
This experiments explains the ignition in the diesel engine. Very high pressure creates such a high temperature that the diesel-air mixture in the displacement ignites itself (self-igniter).

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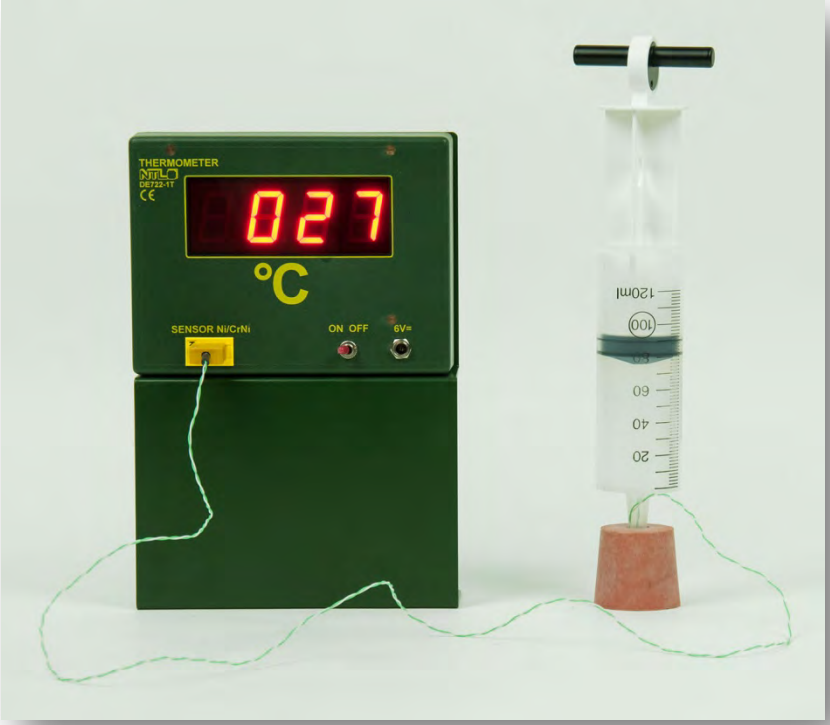
Experiment variant b)

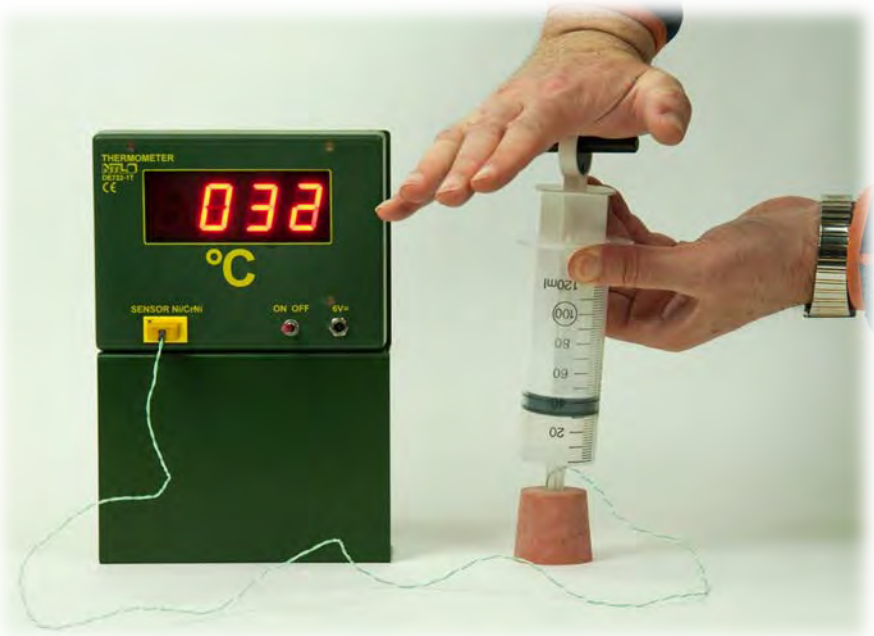
For Students the experiment setup displayed on the image to the right is better visible.

The syringe is drawn up to about 80 ml.

Insert the tip of temperature sensor into the syringe, it should be around 1-2 cm on the inside of the syringe.



The sensor is bent over at the end of the tip and the syringe and sensor are pressed firmly into the hole of the rubber stopper.



The syringe is held with one hand and with the other hand the piston pressed in as firmly as possible.