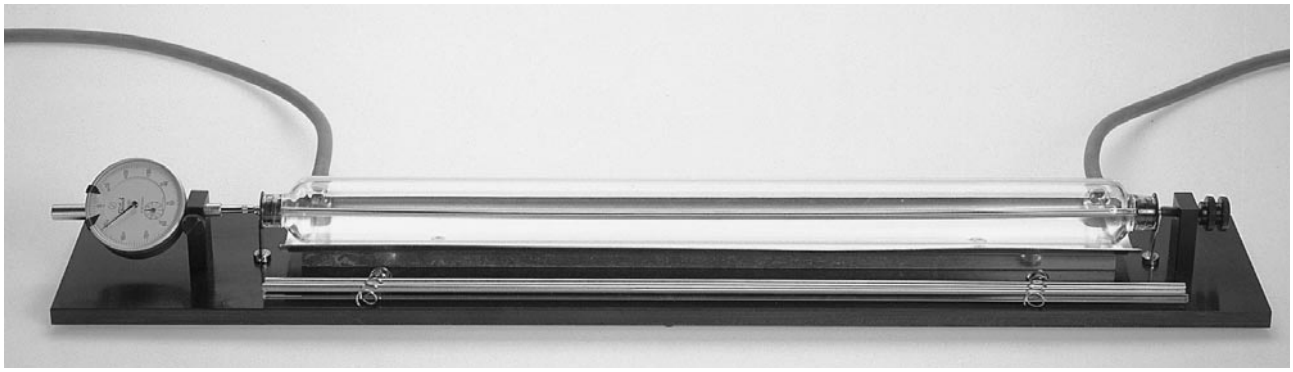
Expansion apparatus

14.12.10 Ae 2655.10



Apparatus for determination of the coefficient of linear expansion of iron, copper, aluminium and glass.

The apparatus consists of a holder mounted with a dial-Gauge, 4 rods of iron, copper, aluminium and glass respectively, and a glass jacket for mounting the rods. Heating of the rod takes place by passing hot water or water vapour through the jacket.

Theori:

A good approximation of the connection between temperatur increase of a material T and the increse in length of the material L is

$$L = \alpha \cdot T$$

α is a caracteristic dimension for a given material, a specific material constant

Theoretical values for the included materials:

Material	Iron	Copper	Aluminium	Glass
α/m/°C	ca. $12 \cdot 10^{-6}$	$16{,}5 \cdot 10^{-6}$	$23{,}8 \cdot 10^{-6}$	$9 \cdot 10^{-6}$

Operation

Mount the chosen rod carefully in the glass jacket, place it in the holder so that the rod lies on the two V-holders. By means of the fingerscrews opposite the dial-Gauge the rod is adjusted to reset the dial-Gauge to zero point. For fine adjustment of the dial-Gauge, turn the outer cap and the measure scale follows. The dial-Gauge can be reseted precisely this way.
The glass jacket is mounted with rubber tubes and connected to the heating source, either hot water or a steam generator.

WARNING: By the use of steam as heating source, make safety devices to prevent that the steam escapes unintended and burn the persons who work with the apparatus. In addition the system must be open to prevent overpressure.

After some time when the system has reached equilibrium, T and L can be determined.

Measurements:

Temperatur is mesured by measuring the temperature of the water. Length is read on the dial-Gauge.
If steam is used as a heating source the steam temperatur is approx. 100 °C.
α kan be determined graphically by plotting L against T and thus reading α as the value of the slope or by calculating the value from the equation: $L = \alpha \cdot T$.

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