3.2.05-00 Adiabatic coefficient of gases – Flammersfeld oscillator

What you can learn about ...

- ➔ Equation of adiabatic change of slate
- ➔ Polytropic equation
- ➔ Rüchardt's experiment
- ➔ Thermal capacity of gases

Principle:

A mass oscillates on a volume of gas in a precision glass tube. The oscillation is maintained by leading escaping gas back into the system. The adiabatic coefficient of various gases is determined from the periodic time of the oscillation.

What you need:

Gas oscillator, Flammersfeld	04368.00	1
Graduated cylinder, BORO 3.3, 1000 ml	36632.00	1
Aspirator bottle, clear glass, 1000 ml	34175.00	1
Air control valve	37003.00	1
Light barrier with counter	11207.30	1
Power supply 5 V DC/2.4 A with 4 mm plugs	11076.99	1
Micrometer	03012.00	1
Glass tube, AR-glass, right-angled, l = 85 + 60 mm, 10 pcs.	36701.52	1
Rubber stopper, d = 22/17 mm, 1 hole	39255.01	1
Rubber stopper, d = 32/26 mm, 1 hole	39258.01	1
Rubber tubing, d_i = 6 mm, l = 1 m	39282.00	2
Sliding weight balance, 101 g	44012.01	1
Aquarium pump, 230 V AC	64565.93	1
Aneroid barometer	03097.00	1
Stopwatch, 15 minutes	03076.01	1
Tripod base -PASS-	02002.55	1
Support rod -PASS-, square, l = 400 mm	02026.55	1
Right angle clamp -PASS-	02040.55	2
Universal clamp	37718.00	1
Pressure-reducing valves, CO_2 / He	33481.00	1
Pressure-reducing valves, nitrogen	33483.00	1
Steel cylinders, carbon dioxide, 10 l	41761.00	1
Steel cylinders, nitrogen, 10 l	41763.00	1

Complete Equipment Set, Manual on CD-ROM included
Adiabatic coefficient of gases – Flammersfeld oscillator P2320500

Ten measurements, each of about n = 300 oscillations, gave for the adiabatic coefficients

Argon	χ = 1.62 ± 0.09
Nitrogen	χ = 1.39 ± 0.07
Carbon dioxide	χ = 1.28 ± 0.08
Air	χ = 1.38 ± 0.08

Tasks:

Determine the adiabatic coefficient χ of air nitrogen and carbon dioxide (and also of argon, if available) from the periodic time of the oscillation T of the mass m on the volume V of gas