

WL 103

Expansion of ideal gases



Learning objectives/experiments

- determination of the adiabatic exponent according to Clément-Desormes
- adiabatic change of state of air
- isochoric change of state of air

Description

- operation with negative pressure and positive pressure
- precise pressure measurement
- experiments according to Clément-Desormes

Gas laws belong to the fundamentals of thermodynamics and are dealt with in every training course on thermodynamics.

The experimental unit WL 103 enables the user to examine the expansion of ideal gases. The focus is on the experimental determination of the adiabatic exponent of air using the Clément-Desormes method.

The main components of the experimental unit are two interconnected cylindrical tanks. Positive pressure can be applied to one tank, negative pressure can be applied to the other tank.

To generate the positive pressure and the negative pressure in the tanks, the tanks are connected to each other via a compressor. The pressure equalisation can either take place with the environment or with the other tank through a bypass. Due to the high velocity of the pressure compensation the change of state is quasi adiabatic. Ball valves are used for pressure equalisation.

Precise pressure measurement technology is integrated in the tanks to enable the determination of the adiabatic exponent using the Clément-Desormes method. The measured temperatures and pressures are recorded, transmitted to the software and displayed.

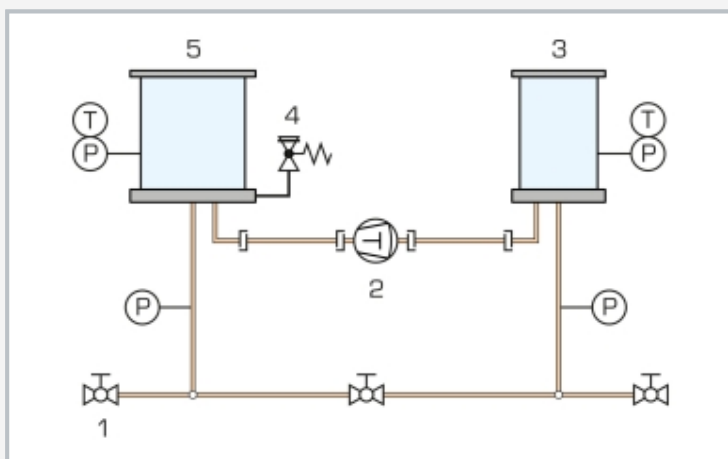
The GUNT software of WL 103 offers all the advantages of software-supported experimental procedure and analysis.

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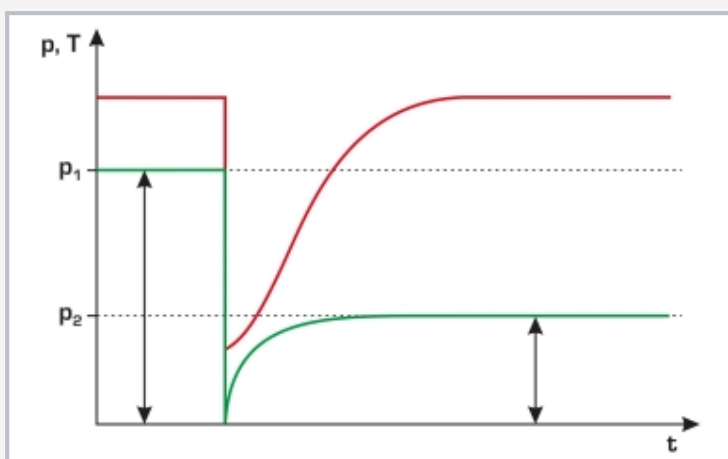
Expansion of ideal gases



1 positive pressure tank, 2 safety valve, 3 ball valve, 4 manometer, 5 compressor, 6 negative pressure tank



1 ball valve, 2 compressor, 3 negative pressure tank, 4 safety valve, 5 positive pressure tank; P pressure, T temperature



Schematic diagram of a typical experiment according to Clément-Desormes;
p pressure, T temperature, t time, red: temperature, green: pressure

Specification

- [1] behaviour of ideal gases
- [2] precise measurement of pressures and temperatures
- [3] transparent components
- [4] experiment according to Clément-Desormes
- [5] determination of the adiabatic exponent of air
- [6] GUNT software with control functions and data acquisition via USB under Windows 11

Technical data

Positive pressure tank

- volume: 20,5L
- diameter: 0,25m
- max. operating pressure: 0,9bar

Negative pressure tank

- volume: 11L
- diameter: 0,18m
- min. operating pressure: -0,6bar

Measuring ranges

- temperature: 0...150°C
- pressure: 0...1,6bar (abs)

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: approx. 670x590x680mm

Weight: approx. 36kg

Required for operation

PC with Windows

Scope of delivery

- 1 experimental unit
- 1 GUNT software + USB cable
- 1 set of instructional material

WL 103

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Optional accessories

for Remote Learning

GU 100 Web Access Box

with

WL 103W Web Access Software

Other accessories

WP 300.09 Laboratory trolley