

ET 122

Vortex cooling device



Description

- **demonstration of the vortex principle**
- **cooling and heating using compressed air**

The experimental unit generates cold and hot air with the aid of ordinary compressed air. The central element of the experimental unit is a vortex cooling device also known as a vortex tube. In the vortex tube the tangentially incoming compressed air is moved in rapid rotation. This creates a cold and hot air flow in the vortex tube which leaves the vortex tube at opposite ends.

A vortex cooling device does not have any moving parts, is maintenance-free and immediately ready for operation. The vortex cooling device is used for the convective cooling of high-speed tools, the air conditioning of protection suits and the cooling of switch cabinets. It is particularly suited for use in explosive environments. One benefit here is that the vortex cooling device does not require an electric power supply.

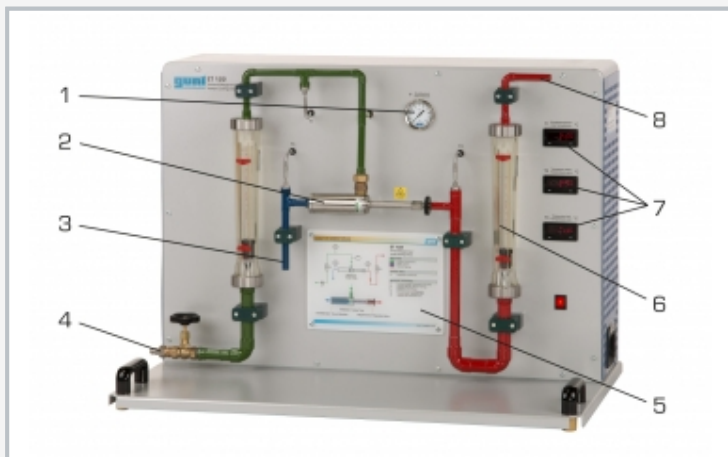
The inlet pressure is measured using a manometer. The compressed air volume and the outlet volume of the hot air flow are each measured using a rotameter. The inlet temperature of the compressed air and the outlet temperatures of the cold and hot air flows are displayed digitally.

Learning objectives/experiments

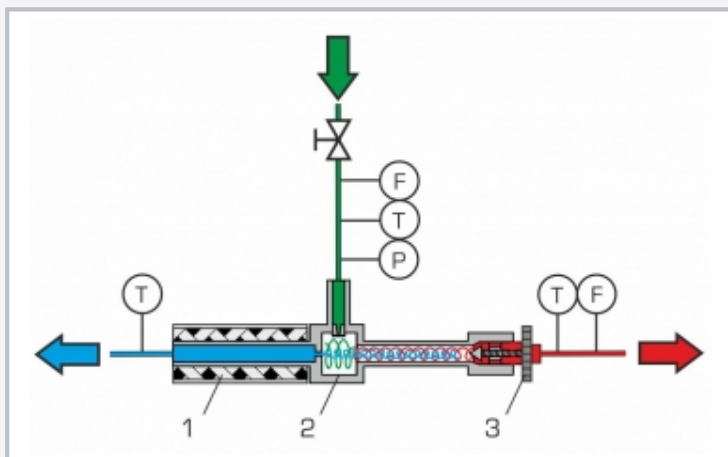
- function and operation of a vortex cooling device
- air flow distribution dependent on the temperature of the cold air flow
- effect of the inlet pressure on heating and refrigeration capacity

ET 122

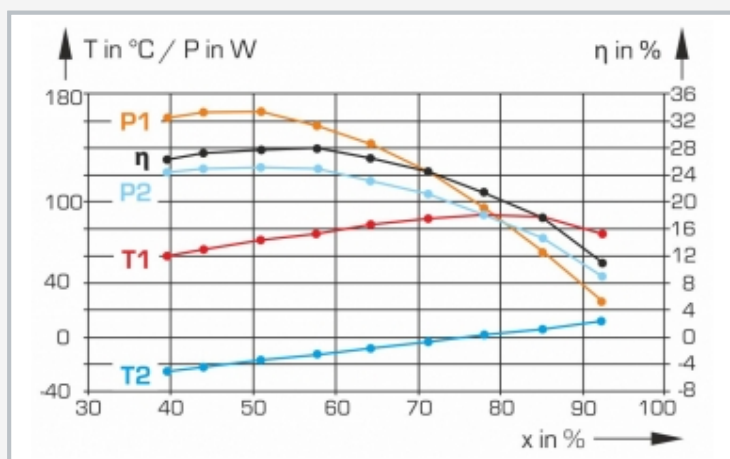
Vortex cooling device



1 manometer, 2 vortex tube, 3 cold air outlet, 4 compressed air connection, 5 process schematic, 6 flow meter, 7 temperature displays, 8 hot air outlet



1 sound absorber, 2 vortex tube, 3 valve for adjusting the temperature of cold air; T temperature, P pressure, F flow rate; blue: cold air, red: hot air, green: compressed air



Temperature curve, capacity and efficiency depending on the cold air ratio; red T1: hot air, blue T2: cold air, orange P1: heat capacity, light blue P2: refrigeration capacity, black: cold air efficiency, x cold air ratio

Specification

- [1] functional model for cold air generation using a vortex cooling device (vortex tube) with the aid of compressed air
- [2] experimental unit with clear design of all components at the front
- [3] simple design, no moving components, wear-free
- [4] measuring of the compressed air inlet pressure by manometer
- [5] flow rate measurement of compressed air and exhaust hot air by rotameters
- [6] digital displays for inlet temperature and outlet temperature of cold and hot air

Technical data

Vortex cooling device

- inlet pressure: 5,5bar
- air consumption: max. 420L/min
- refrigeration capacity: max. 267W (230kcal/h)
- minimum temperature: -40°C
- maximum temperature: 110°C

Measuring ranges

- temperature: 3x -50...150°C
- pressure: 0...10bar
- flow rate: 2x 2...25m³/h

230V, 50Hz, 1 phase
 230V, 60Hz, 1 phase
 120V, 60Hz, 1 phase
 LxWxH: 1000x600x710mm
 Weight: approx. 50kg

Required for operation

compressed air: min. 6bar, 25m³/h

Scope of delivery

- 1 experimental unit
- 1 set of accessories
- 1 set of instructional material

ET 122

Vortex cooling device

Optional accessories

020.30009 WP 300.09 Laboratory trolley