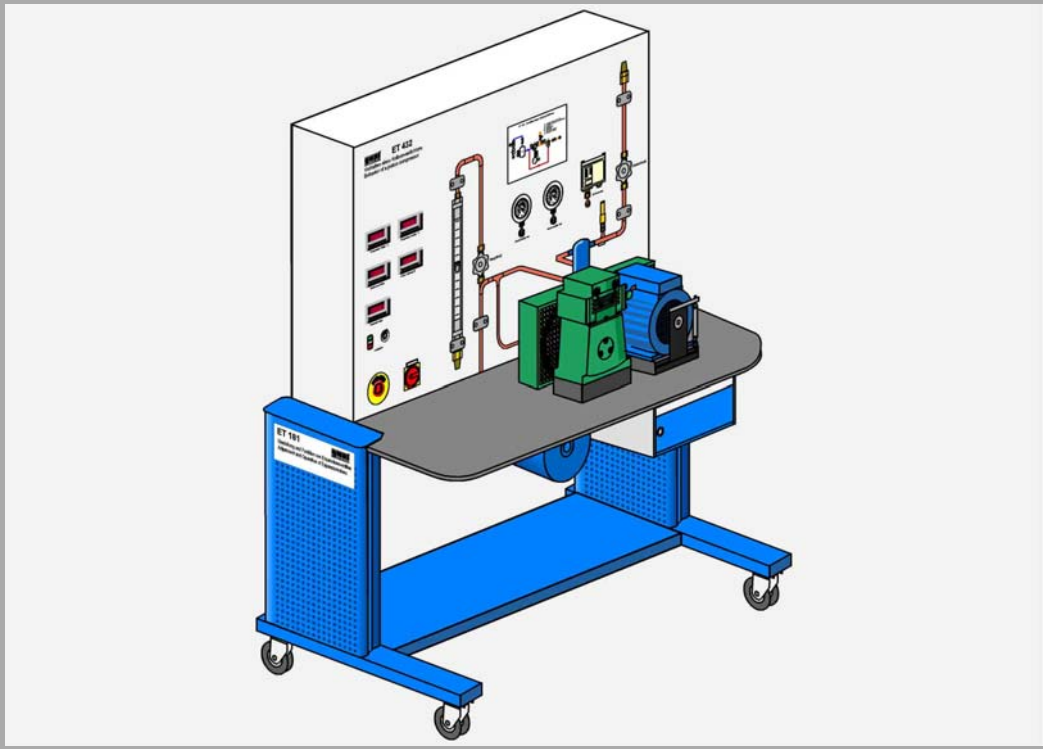
ET 432 Behaviour of a Piston Compressor



*** Open 2-cylinder piston compressor from refrigeration**

*** Record of the pressure/volume flow characteristic**

*** Measurement of intake volume and pressure ratio**

*** Determination of volumetric and mechanical efficiency**

Technical Description

Smaller refrigeration systems usually have a piston compressor. Piston compressors are positive displacement machines. These differ in their characteristics decisively from flow equipment which include the turbo compressors that are common in very large systems.

In piston compressors the flow rate is mainly dependent on the displaced volume and speed. Due to the unavoidable dead space the flow rate drops with increasing pressure ratio. Because the flow rate is a measure for the refrigeration capacity of the refrigeration system, the properties of the compressor are important for the whole system.

In this trainer a commercial open refrigerant compressor is operated in an open process with air. The inlet and outlet pressures and thus the pressure ratio can be adjusted via valves in wide ranges. The drive via a frequency converter permits variable speeds. Pressures, temperatures, electric power consumption, speed and torque are recorded and displayed at the equipment. The compressor efficiency is calculated from the electrical and mechanical power.

The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

Learning Objectives / Experiments

- Determine characteristic variables of a piston compressor during experiments
- Record of the pressure/volume flow characteristic
- Determination of the volumetric efficiency at different intake pressures, pressure ratios and speeds
- Determination of the isothermal compressor capacity
- Measurement of the mechanical and electrical power consumption in dependence of the intake pressure and pressure ratio
- Determination of the mechanical efficiency and the overall efficiency

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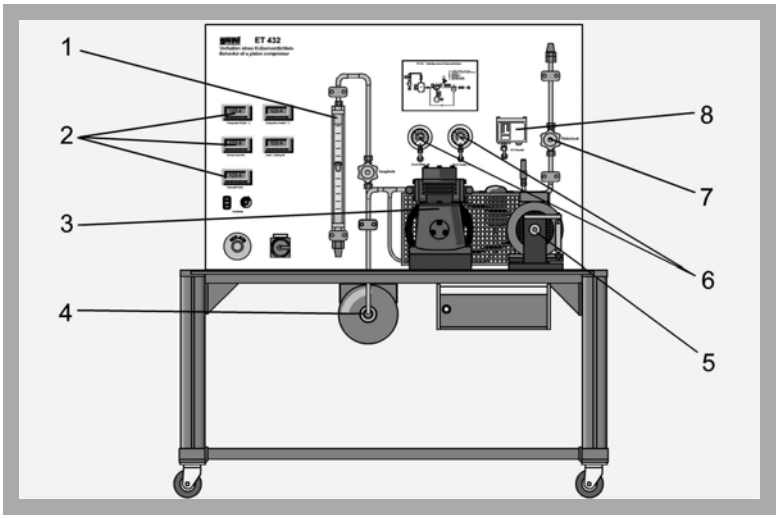
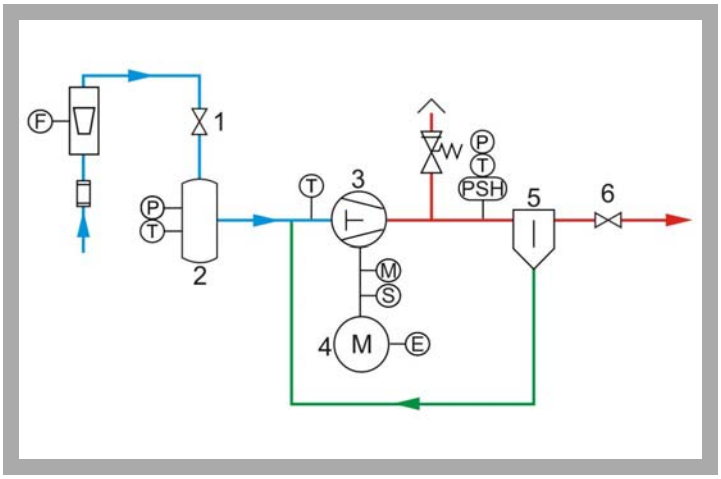
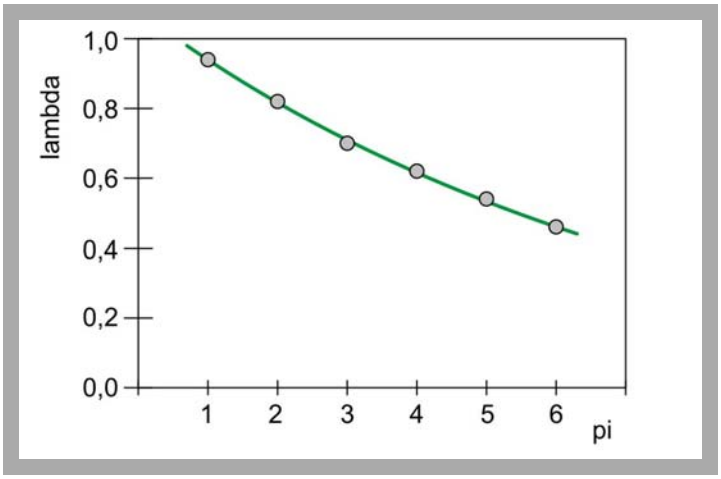


1 flow meter, 2 displays and controls, 3 refrigerant compressor, 4 stabilisation tank, 5 drive motor with torque measurement, 6 manometer, 7 valve, 8 pressure switch



1 intake side valve, 2 stabilisation tank, 3 compressor, 4 drive motor, 5 oil separator, 6 delivery side valve; F flow rate, T temperature, P pressure, M torque, S speed, E electric power, PSH pressure switch; blue: low pressure, red: high pressure, green: oil return



Progression of the volumetric efficiency lambda in dependence on the pressure ratio pi

Specification

[1] Experimental unit for piston compressor from refrigeration
[2] Open process with air
[3] Typical open 2-cylinder compressor
[4] Drive via asynchronous motor with frequency converter for speed adjustment
[5] Inlet pressure and outlet pressure (pressure ratio) adjustable via valves
[6] Instruments: manometer, flow meter, temperature sensor, speed, torque (via force), digital power indication

Technical Data

Compressor
- speed: 480...975min^{-1}
- number of cylinders: 2
- stroke: 26mm
- borehole: 35mm
- displaced volume: 50cm³
- max. intake capacity: 49L/min
- max. pressure: 20bar

Drive motor power: 370W

Measuring ranges
- torque: 0...5Nm
- speed: 0...3000min^{-1}
- electric power: 0...1000W
- temperature: 0...100°C
- pressure: -1...9bar / -1...24bar
- flow rate: 8...80L/min

Dimensions and Weight

l x w x h: 1400x790x1750mm
Weight: approx. 150kg

Connections

230V, 50Hz, 1 phase

Scope of Delivery

1 trainer
1 set of instructional material

Order Details

061.43200	ET 432	Behaviour of a Piston Compressor