

ET 432

Piston compressor in refrigeration



screen mirroring is possible on up to 10 end devices

Description

- open two-cylinder piston compressor from refrigeration
- measure and evaluate typical variables
- integrated router for operation and control via an end device and for screen mirroring on up to 10 end devices: PC, tablet, smartphone

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 capacity of the whole system.

In ET 432 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.

The trainer is controlled by the PLC via touch screen. By means of an integrated router, the trainer can alternatively be operated and controlled via an end device. The user interface can also be displayed on additional end devices (screen mirroring). Via the PLC, the measured values can be stored internally. Access to stored measured values is possible from end devices via WLAN with integrated router/LAN connection to the customer's own network. Via direct LAN connection the measured values the measured values can be transferred to a PC and stored there (e.g. via MS Excel).

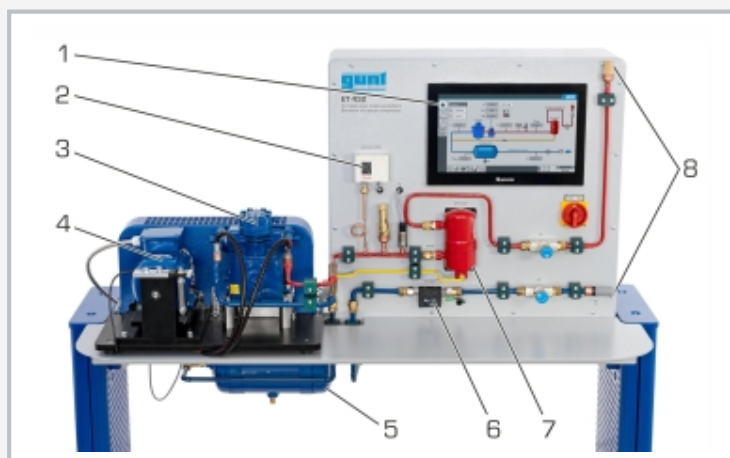
Digital multimedia teaching material is available at the Science Media Center.

Learning objectives/experiments

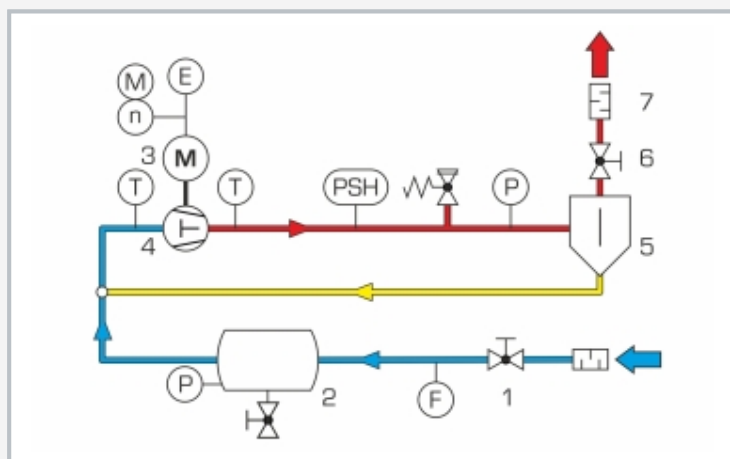
- determine characteristic variables of a piston compressor during experiments
- determination of the volumetric efficiency at different intake pressures, pressure ratios and speeds
- determination of the isothermal compressor capacity
- measurement of the mechanical and electrical power consumption in dependence of the high/low pressure and pressure ratio
- determination of the mechanical efficiency and the overall efficiency
- GUNT Science Media Center, develop digital skills
 - ▶ retrieve information from digital networks
 - ▶ use digital learning media, e. g. Web Based Training (WBT)
 - ▶ use visualisation systems

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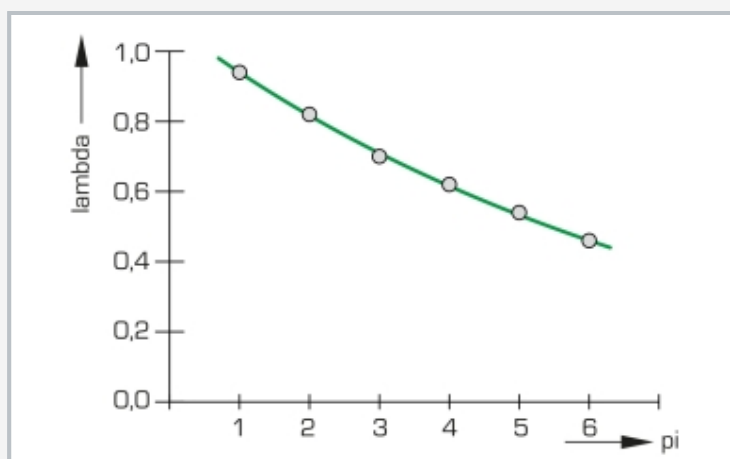
Piston compressor in refrigeration



1 PLC with touch screen, 2 pressure switch, 3 refrigerant compressor, 4 drive motor with torque measurement, 5 stabilisation tank, 6 flow meter, 7 oil separator, 8 silencer



1 intake side valve, 2 stabilisation tank, 3 drive motor, 4 compressor, 5 oil separator, 6 delivery side valve, 7 silencer; F flow rate, T temperature, P pressure, M torque, n speed, E electric power, PSH pressure switch; blue: low pressure, red: high pressure, yellow: oil return



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

Specification

- [1] test stand for piston compressor from refrigeration
- [2] open process with air
- [3] typical open two-cylinder compressor
- [4] control of the experimental plant using a PLC, operated by touch screen
- [5] screen mirroring: possible to mirror the user interface on up to 10 end devices
- [6] drive via asynchronous motor with frequency converter for speed adjustment
- [7] inlet pressure and outlet pressure (pressure ratio) adjustable via valves
- [8] instruments: flow meter, sensors for pressure, temperature, speed, torque (via force)
- [9] data acquisition via PLC on internal USB memory, access to stored measured values via WLAN/LAN with integrated router/LAN connection to customer's own network or direct LAN connection without customer network

Technical data

PLC: Weintek cMT3162X

Compressor

- speed: 465...975min⁻¹
- number of cylinders: 2
- stroke: 26mm
- borehole: 35mm
- displaced volume: 50cm³

Drive motor

- power: 550W
- speed: 0...975min⁻¹

Measuring ranges

- torque: 0...10Nm
- speed: 0...10000min⁻¹
- power: 0...600W
- temperature: 0...100°C, 0...200°C
- flow rate: 0...6m³/h
- pressure:
 - ▶ pressure sensor: -1...1,5bar / -1...24bar

230V, 50Hz, 1 phase; 230V, 60Hz, 1 phase

120V, 60Hz, 1 phase; UL/CSA optional

LxWxH: 1512x790x1414mm

Weight: approx. 148kg

Required for operation

ventilation: 3,2m³/h; PC with Windows recommended

Scope of delivery

- 1 trainer
- 1 online access to GUNT Science Media Center
- 1 set of instructional material