ET 508
Simulation of a two-stage air compressor

Description

■ **simulated compressor system with intermediate cooling and aftercooling**

This experimental unit allows variables that affect the process (such as capacity, dead space, flow rate and state of the intake air) to be adjusted from the panel.

The simulator can model operating states up to the theoretical limits. The significance of the dead space and air re-expansion thus becomes clear.
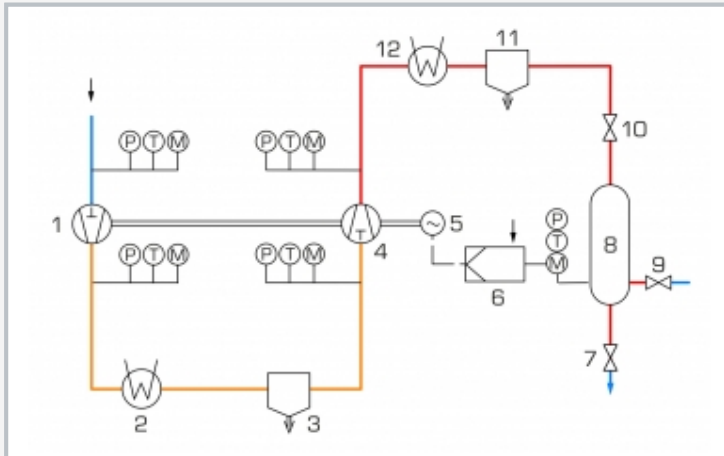
The measured values are transmitted directly to a PC via USB. The data acquisition software is included.

Learning objectives/experiments

■ basic principles of the multistage compression process
■ special features of a multistage compressor
■ thermodynamic state variables
■ depiction of a compression process on a T-s diagram and on a p-V diagram
■ condensation in the intercooler and aftercooler
■ on-off pressure control with hysteresis

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1 compressor, 2 heat exchanger for intercooling, 3 separator, 4 compressor, 5 motor, 6 pressure regulator, 7 expansion valve, 8 pressure vessel, 9 safety valve, 10 valve, 11 separator, 12 heat exchanger for recooling; sensors: P pressure, T temperature, M humidity; blue: low pressure, orange: medium pressure, red: high pressure

Specification

[1]   simulated operation of a two-stage compressor system with intermediate cooling and aftercooling
[2]   modification of 9 system parameters using potentiometers
[3]   software calculates: intake air flow rate, compressor stroke stage 1+2, pressure ratio stage 1+2, heat transfer at condensation, delivered air flow
[4]   GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

9 potentiometers for the setting of
- intake pressure: 0...2bar abs.
- intake temperature: 0...100°C
- relative humidity: 0...100%
- coolant flow rate: 0...100kg/h at 15°C
- flow control valve setting: 0...100%
- vessel, nominal pressure: 0...50bar
- motor speed: 0...1000min^{-1}
- vessel capacity: 0...1000L
- dead space: 0...100%

Inputs and outputs
- 16x analogue in, 1x analogue out
- 4x digital in/out

LxWxH: 600x350x480mm
Weight: approx. 15kg

Required for operation

PC with Windows

Scope of delivery

1   experimental unit
1   GUNT software CD + USB cable
1   manual

Optional accessories

| 020.30009 | WP 300.09 | Laboratory trolley |