

MT 175

Energy efficiency in compressed air systems



Augmented reality interface available for mobile devices (tablet not included)

Description

- **experimental determination of energy, heat, power and efficiency**
- **estimate savings potential**
- **experimental plant controlled via GUNT software**
- **part of GUNT DigiSkills learning projects**
- **augmented reality for visualisation**

Compressed air is an essential form of energy in industry. Production is costly and there are many ways to save energy. Using the MT 175 compressed air system, trainees and students familiarise themselves fully with the industry standard of typical compressed air system components and can assess potential savings.

The system contains functional groups for compressed air generation, preparation, distribution and storage. The compressed air is drawn from the system via various consumers. The core component of the compressed air generation system is an efficient screw compressor. The heat generated during compression is dissipated via two cooling circuits and utilised as room heating. The energy flows within the compressed air system are determined and analysed. The efficiency of the system is calculated.

Various consumers are used to consolidate the learning content through experiments. Continuous consumers: load lifter, leaks. Short-term consumers: blow-out gun for measurements with fluctuating consumption. All the consumers can be combined and compared with each other. In addition, the compressed air tank can be optionally filled through lines of different diameters.

All necessary measured values are recorded and displayed in the GUNT software. The compressor unit is monitored remotely via a Profinet connection to the GUNT software. For an energy analysis of the system, corresponding characteristic variables are calculated from all measured values in the GUNT software. An augmented reality interface (Vuforia View) is available for mobile devices to visualise the compressor.

In the GUNT Media Center, extensive technical information is available as didactic multimedia teaching materials. The teaching material is supplemented by worksheets with solutions.

Learning objectives/experiments

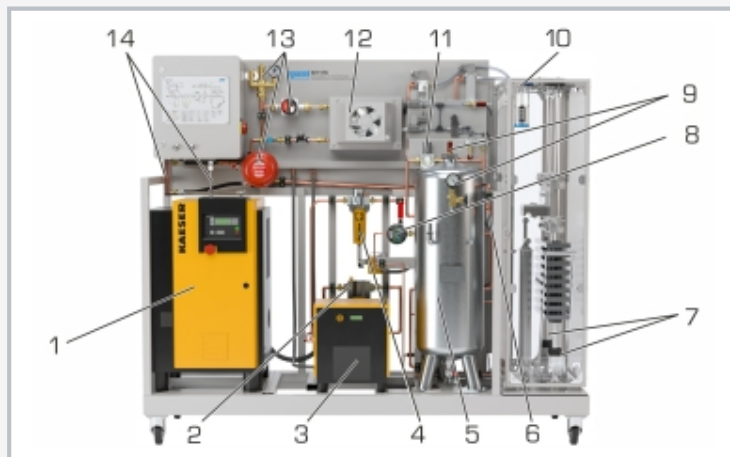
- **energy analysis of a compressed air system, calculate efficiency**
- **estimate savings potential**
- **familiarisation with and investigation of typical industrial components of the system**
- **adjust the control behaviour of the compressor**
- **leak test**
- **study continuous and short-term consumers, individually or in combination**
- **how pipes and the individual components affect pressure losses**
- **familiarisation with remote monitoring of the compressor unit**

GUNT Media Center, develop digital skills

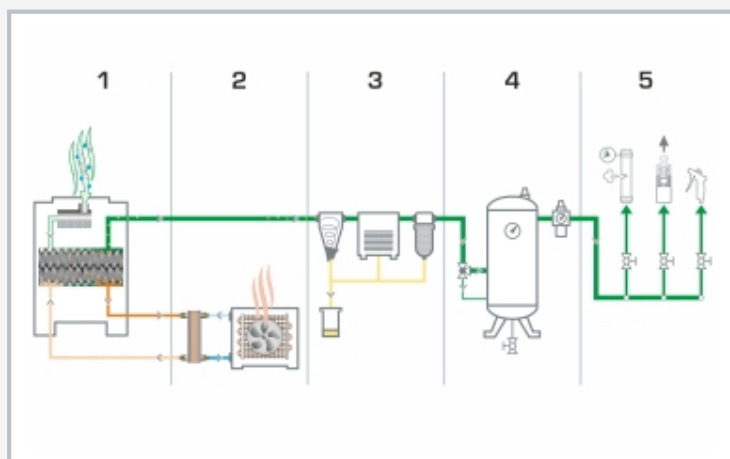
- **retrieve information from digital networks**
- **use digital learning media and digital techniques**
- **use visualisation systems, e.g. augmented reality**

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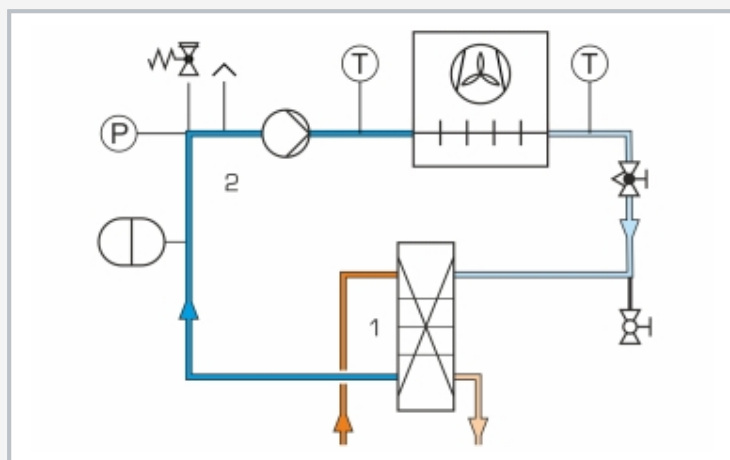
Energy efficiency in compressed air systems



1 compressor unit, 2 centrifugal separator (cyclone type), 3 refrigerant dryer, 4 filter, 5 compressed air tank, 6 connection for short-term consumers, e.g. blow-out gun, 7 load lifter: two pneumatic cylinders as continuous consumers, 8 selection: large/small pipe, 9 safety group, 10 leak via orifice plates, 11 maintenance unit, 12 water/air heat exchanger with fan, 13 secondary cooling circuit with water, 14 primary cooling circuit with oil



Functional groups of the compressed air system: 1 compressed air generation, 2 heat recovery, 3 compressed air preparation (centrifugal separator, refrigerant dryer, filter), 4 storage with safety group and maintenance unit, 5 continuous and short-term consumers; green: compressed air, orange: oil, blue: water, yellow: condensate with oil



Heat recovery with two cooling circuits
1 primary cooling circuit with oil/water plate heat exchanger
2 secondary cooling circuit with water/air finned tube heat exchanger
orange: oil circuit, blue: water circuit; P pressure, T temperature

Specification

- [1] industry standard compressed air system with generation, preparation, distribution, storage and heat recovery
- [2] estimate potential savings and implement energy efficiency measures
- [3] various consumers in experiments individually or in combination
- [4] augmented reality: visualisation of the compressor system
- [5] system controlled via GUNT software
- [6] measurement of all relevant data for evaluating the processes
- [7] remote monitoring of the compressor unit
- [8] online access to the GUNT Media Center with multimedia teaching material
- [9] network capability: observe, acquire, analyse experiments at any number of workstations with GUNT software via the customer's own LAN/WLAN network

Technical data

Screw compressor, oil-cooled
 ■ positive pressure: max. 11 bar
 ■ speed, drive: max. 2910 min⁻¹

Centrifugal separator, separation efficiency: max. 99%, pressure loss < 0,1 bar
 Refrigeration dryer, pressure loss 0,05 bar
 Filter, pressure loss < 0,05 bar

Tank, volume 90L, safety valve: 11 bar
 Tank filling: tubes: Ø 8mm, Ø 15mm
 Maintenance unit, pressure: inlet: max. 16 bar, outlet adjustable: 0,5...10 bar

2 pneumatic cylinders, double-acting: Ø 32mm, 40mm
 ■ stroke: 500mm
 ■ operating pressure: 0,6...12 bar
 2 orifice plates: openings Ø 2mm, 5mm
 Blow-out gun, operating pressure: 0...12 bar

Measuring ranges
 ■ volumetric flow rate: water 0,9...15 L/min
 ■ power: 0...3000 W
 ■ pressure: 3x 0...16 bar; 1x -0,4...20 bar
 ■ temperature: 4x -50...180 °C; 1x -40...125 °C, 1x -50...299,9 °C

400V, 50Hz, 3 phases; 400V, 60Hz, 3 phases
 230V, 60Hz, 3 phases
 LxWxH: 2200x780x1955mm; Weight: approx. 625kg

Required for operation

PC with Windows, Vuforia View for augmented reality application

Scope of delivery

experimental plant, online access to the GUNT Media Center