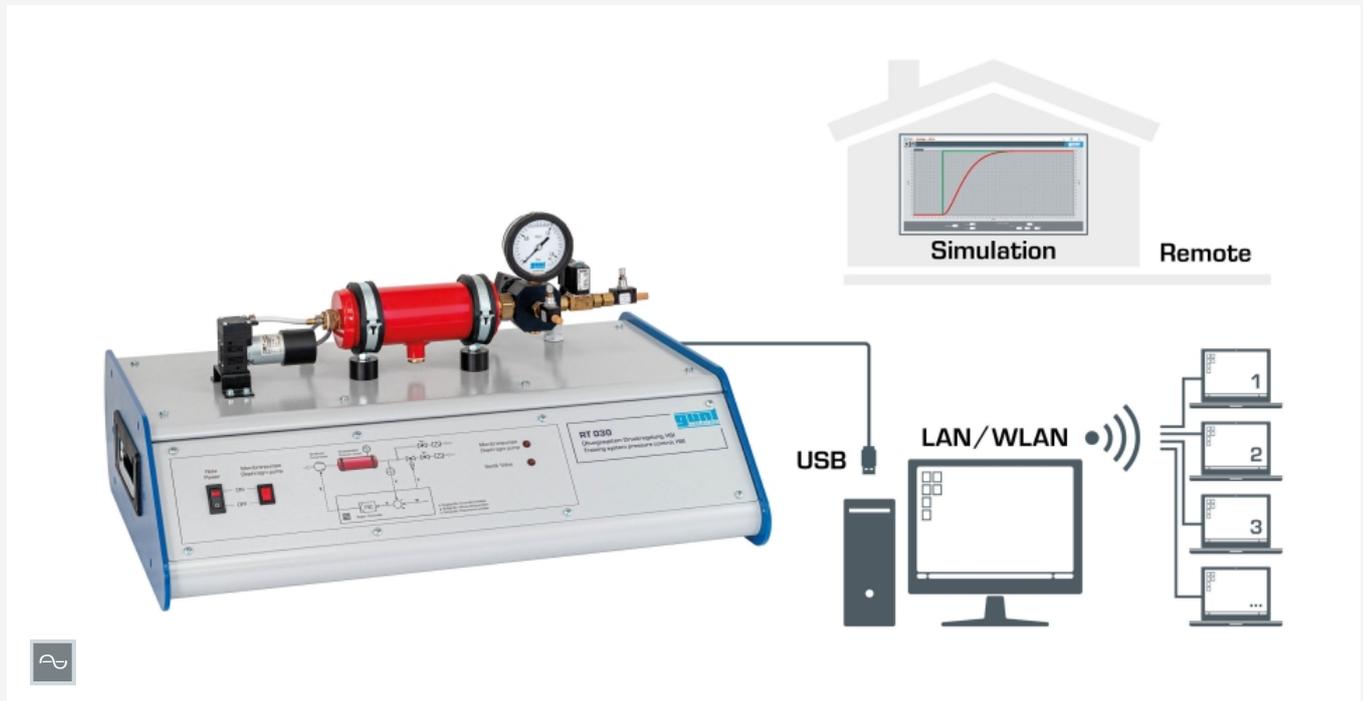# RT 030

Training system pressure control, HSI

Description

- **basic control engineering relationships using the example of a pressure control**
- **configurable and parametrisable software controller with extensive functions**
- **experiment preparation and software simulation for remote learning**
- **experiments can be followed and analysed on the local network**

The RT 030 device offers basic experiments on a pressure controlled system. An air-filled pressure vessel is used as the controlled system. The pressure in the pressure vessel represents the controlled variable, which is determined by a measuring element, in this case a pressure sensor. The output signal from the sensor is fed to the software controller. The output signal from the controller influences the manipulating variable, in this case the compressor speed. This changes the flow rate. A flow control valve acts as a pneumatic consumer. The software is used to switch a solenoid valve on and off in order to study the effect of disturbance variables. This activates a second flow control valve, which represents a second consumer. The control response is displayed in the form of a time dependency. There is a dial-gauge manometer located on the

pressure vessel, allowing the pressure to be read at any time.

The powerful GUNT software for the entire device series – in the form of Hardware/Software Integration (HSI) – is a major component for the entire series. The experimental unit and the PC are connected via a USB interface (external PC required).

The impact that modifications to the system behaviour have can be studied quickly and easily with the help of the software. An integrated programmer allows you to set reference values and time intervals to carry out reference value progressions. Further aspects of control engineering are studied using software simulations for controlled systems up to the 2nd order.

The combination of the clear, real-world controlled system and simulations of other controlled systems in the RT 010 – RT 060 device series aids understanding. Preparations for the experiments, as well as software simulations can be carried out in Remote Learning environments. The experiments can be observed at any number of workstations on the local network.

Learning objectives/experiments

- fundamentals of control engineering using the example of a pressure controlled system
- open control loop response
- controlled system without feedback
- effects of different controller parameters and methods on the closed loop system response
- controller optimisation by changing the controller parameters: K_p, T_n, T_v
- recording of step responses: manipulating variable step, reference value step and disturbance variable step
- manipulating variable limitation and effect on the control system
- effect of disturbance variables
- software simulation of different controlled systems (P, I, PT_1, PT_2)
- comparison of different controlled system parameters

- specific GUNT software for the entire device series
- controller: manual, uncontrolled manual operation, continuous controller, two or three-point controller
- programmer for your own reference value progressions
- design of disturbance variable controllers
- recording of time dependencies
- remote learning: software simulation at any number of workstations

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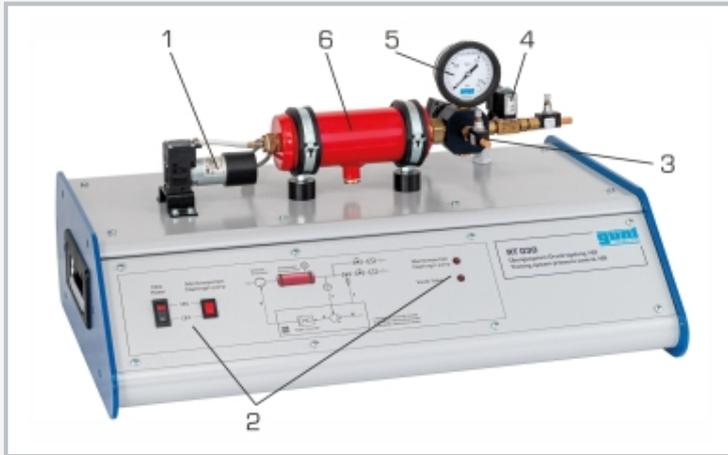
1 diaphragm gas pump as compressor, 2 displays and controls, 3 flow control valve for fixed-setting outlet, 4 solenoid valve with subsequent flow control valve for generating disturbance variable, 5 dial-gauge manometer, 6 pressure vessel
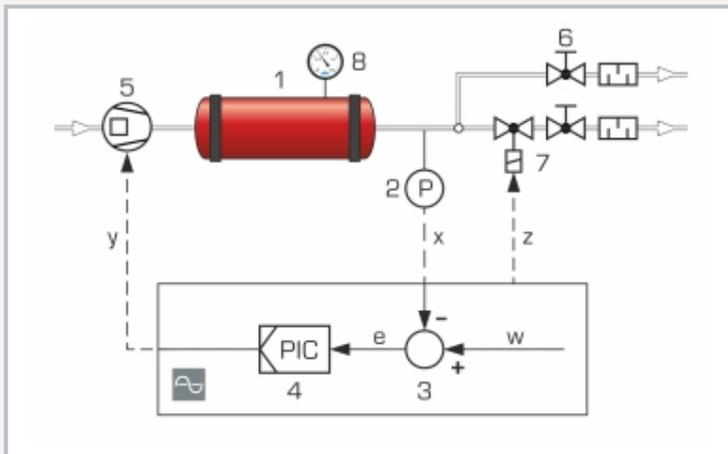
1 controlled system: pressure vessel, 2 measuring element: electronic pressure sensor, 3 comparator: part of the GUNT software, 4 software controller, 5 actuator: speed-controlled diaphragm gas pump, 6 fixed-setting flow control valve as drain, 7 disturbance variable generated via solenoid valve with downstream fixed-setting flow control valve as additional drain, 8 dial-gauge manometer
x controlled variable: pressure, y manipulating variable: delivery rate of the diaphragm gas pump, z disturbance variable: air outlet via solenoid valve with downstream flow control valve, w reference value: input values, e control deviation, P pressure

Software screenshot: pressure control with continuous P controller, reference value steps and persistent control deviation in the controlled variable

Specification

[1]   pressure control: typical controlled system
[2]   controlled system: pressure vessel
[3]   controlled variable: pressure
[4]   measuring element: electronic pressure sensor
[5]   software controller can be configured and parametrised as P, PI, PID and switching controller
[6]   actuator: speed-controlled diaphragm gas pump
[7]   disturbance variable generated via solenoid valve with downstream fixed-setting flow control valve as additional drain
[8]   dial-gauge manometer for observing the pressure
[9]   software simulation: various controlled systems
[10] GUNT software: option to connect any number of external workstations on the local network to follow and analyse the experiment
[11] experiment preparation and software simulation at any number of workstations for remote learning
[12] GUNT software with control functions and data acquisition via USB under Windows 10
[13] multimedia instructional materials online in GUNT Media Center

Technical data

Pressure vessel
- contents: 340mL
- operating pressure: 1bar
- max. pressure: 10bar

Diaphragm gas pump as compressor
- max. flow rate: 3L/min
- max. overpressure: 1bar
- max. underpressure: 250mbar abs.

Pressure control range: 0...1bar
Solenoid valve: Kvs: 0,11m^3/h

Software controller can be configured and parametrised as P, PI, PID and switching controller

Measuring ranges
- pressure: 0...1,6bar (electronic pressure sensor)
- pressure: 0...1,6bar (dial-gauge manometer)

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase
120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 610x420x330mm
Weight: approx. 15kg

Required for operation

PC with Windows

Scope of delivery

1   experimental unit
1   GUNT software + USB cable
1   set of accessories
1   set of instructional material

G.U.N.T. Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Telefon (040) 67 08 54-0, Fax (040) 67 08 54-42, Email sales@gunt.de, Web www.gunt.de
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Optional accessories

WP 300.09   Laboratory trolley