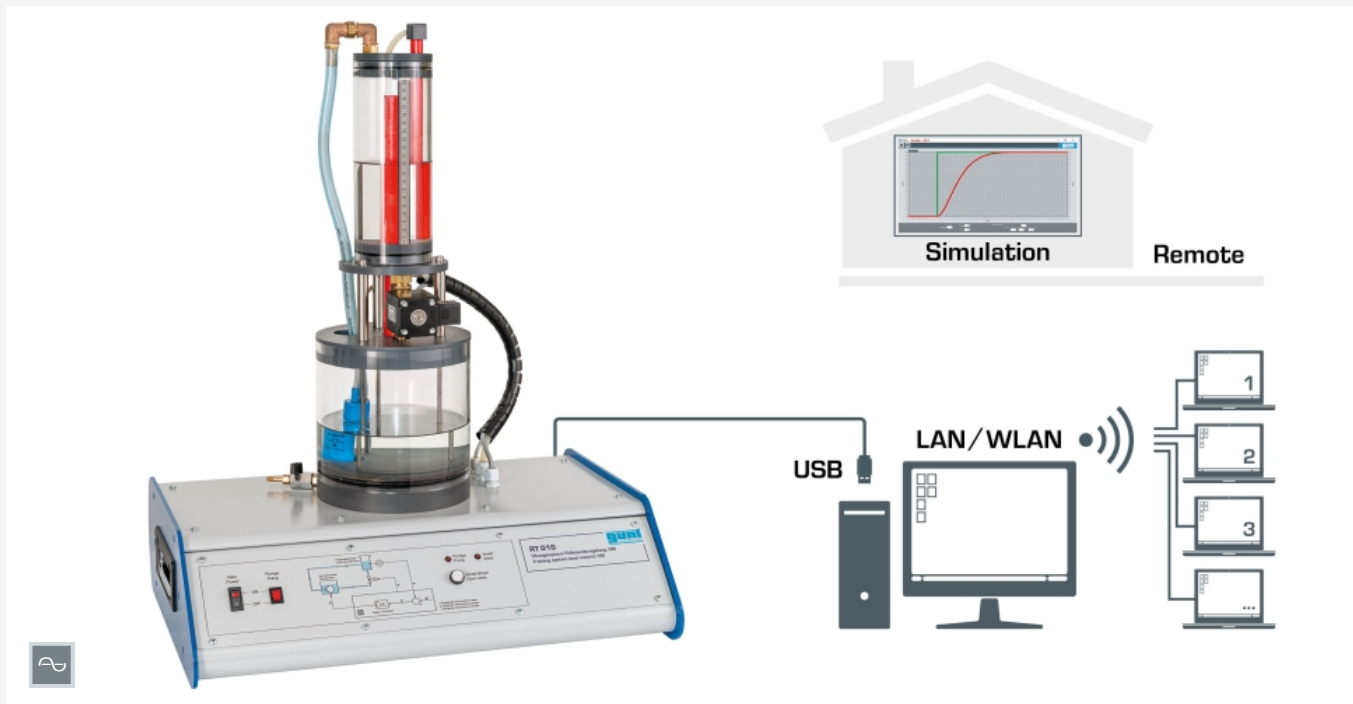


RT 010

Training system level control, HSI



Description

- **basic control engineering relationships using the example of a level 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 010 – RT 060 device series contains a complete introductory course to control technology for the common controlled variables of level, flow rate, pressure, temperature, speed and position. The combination of the clear, real-world controlled system and simulations of other controlled systems 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.

The RT 010 device offers basic experiments on a level controlled system with integral action. A transparent, water-filled tank is used as the controlled system. The level in the tank represents the controlled variable, which is determined by a measuring element,

in this case a differential pressure sensor. The output signal from the sensor is fed to the software controller. The output signal from the controller influences the speed of the pump motor. This changes the flow rate of the actuator, in this case a speed-controlled pump. An electromagnetic proportional valve in the tank outlet can be controlled via the software in order to study the effect of disturbance variables. The control response is displayed in the form of a time dependency. The level can be directly read off the tank scale 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).

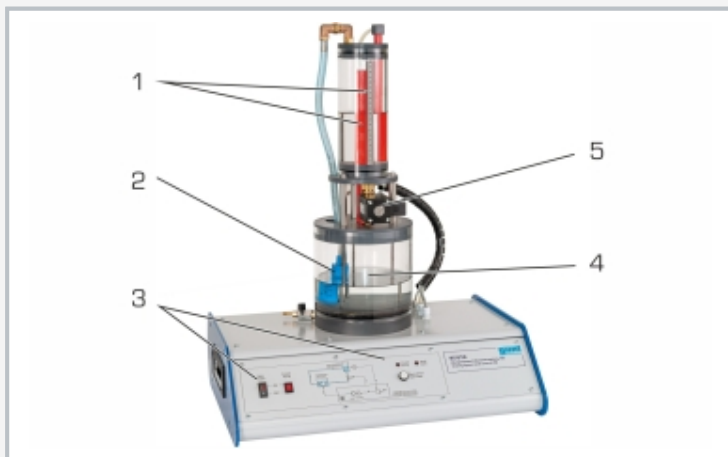
The impact that modifications to the system behaviour have can be studied quickly and easily with the help of the software. An integrated programmer allows you to set reference values and time intervals to carry out reference value progressions. Further aspects of control engineering are studied using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

Learning objectives/experiments

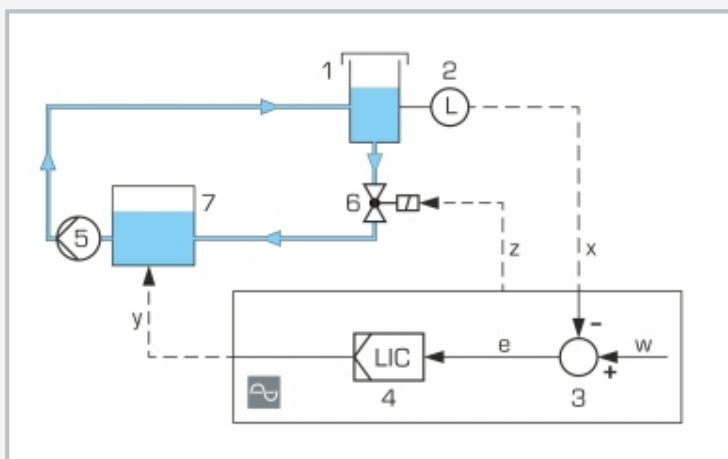
- fundamentals of control engineering using the example of a level controlled system
- open control loop response
- controlled system without feedback
- effects of different controller parameters and methods on the closed loop system response
- controller optimisation by changing the controller parameters: 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, PT₁, PT₂]
- 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

RT 010

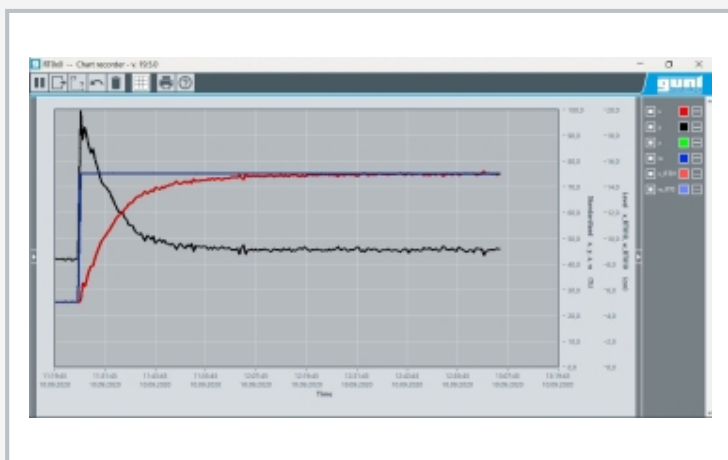
Training system level control, HSI



1 tank with scale and overflow, 2 speed-controlled pump, 3 displays and controls, 4 storage tank, 5 proportional valve



1 controlled system: tank, 2 measuring element: differential pressure sensor to determine the level, 3 comparator: part of the GUNT software, 4 software controller, 5 actuator: speed-controlled pump, 6 disturbance variable generated via proportional valve in tank outlet, 7 storage tank
x controlled variable: level, y manipulating variable: inflow, z disturbance variable: outflow, w reference value: input values, e control deviation, L level



Software screenshot: level control with PID controller, reference value step

Specification

- [1] level control: typical controlled system
- [2] controlled system: transparent tank with scale for monitoring the level
- [3] controlled variable: level
- [4] measuring element: differential pressure sensor to determine the level
- [5] software controller can be configured and parametrised as P, PI, PID and switching controller
- [6] actuator: speed-controlled pump
- [7] disturbance variable generated via electromagnetic proportional valve in the tank outlet
- [8] storage tank for closed water circuit
- [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

Tank with scale and overflow: 1200mL
Storage tank: 3700mL

Pump, speed-controlled
 ■ power consumption: 18W
 ■ max. flow rate: 8L/min
 ■ max. head: 5m

Proportional valve: Kvs: 0,7m³/h

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

Measuring ranges
 ■ pressure: 0...30mbar (0...300mm)

230V, 50Hz, 1 phase
 230V, 60Hz, 1 phase
 120V, 60Hz, 1 phase
 UL/CSA optional
 LxWxH: 600x450x800mm
 Weight: approx. 22kg

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

RT 010

Training system level control, HSI

Optional accessories

020.30009

WP 300.09

Laboratory trolley