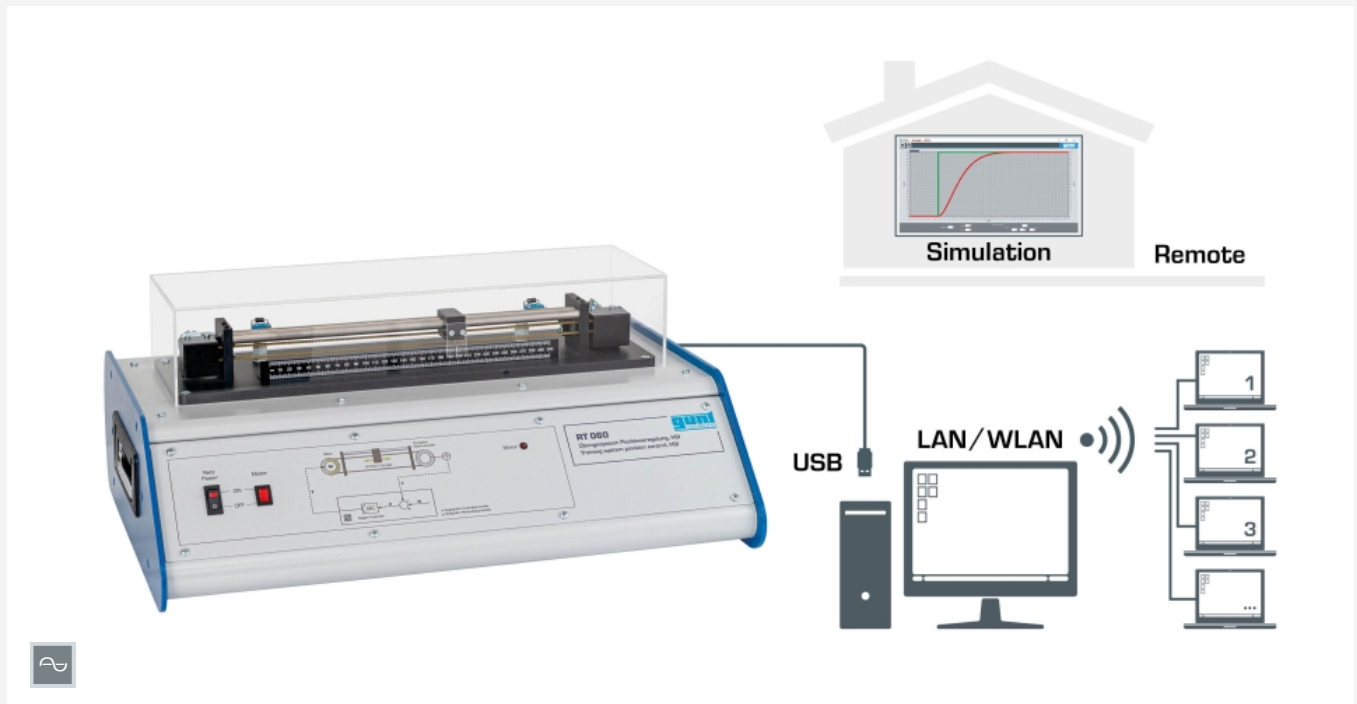


RT 060

Training system position control, HSI



Description

- **basic control engineering relationships using the example of a position controlled system**
- **configurable and parametrizable 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 060 device offers basic experiments on a position controlled system. A moving slide, which is moved by a toothed belt, is used as the controlled system. The position represents the controlled variable. The position of the slide is determined by a measuring element, in this case a rotary encoder. The output signal from the sensor is fed to the software controller. The output signal from the controller controls the actuator, in this case the motor. In this way the slide is pulled into a new position on the toothed belt. The motor is automatically switched off when the moving slide reaches one of the two end positions. The current position can be read directly off a steel scale at any time. The control response is displayed in the form of a time dependency. A transparent protective cover allows the experiments to be observed safely.

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.

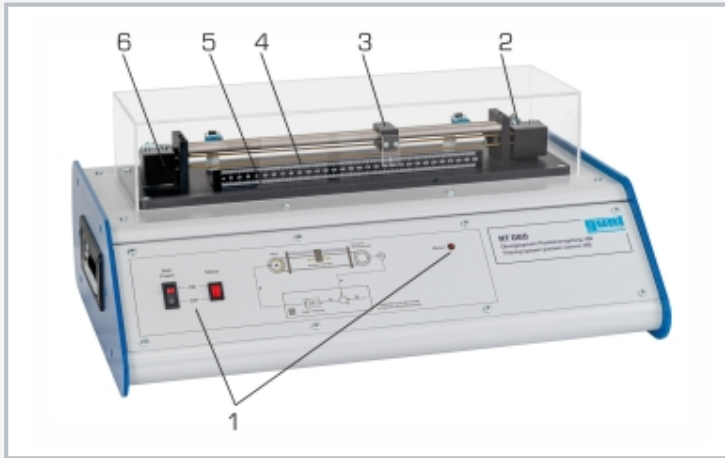
The combination of the clear, real-world controlled system and simulations of other controlled systems in the RT 010 – RT 060 device series aids understanding. Preparations for the experiments, as well as software simulations can be carried out in Remote Learning environments. The experiments can be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

Learning objectives/experiments

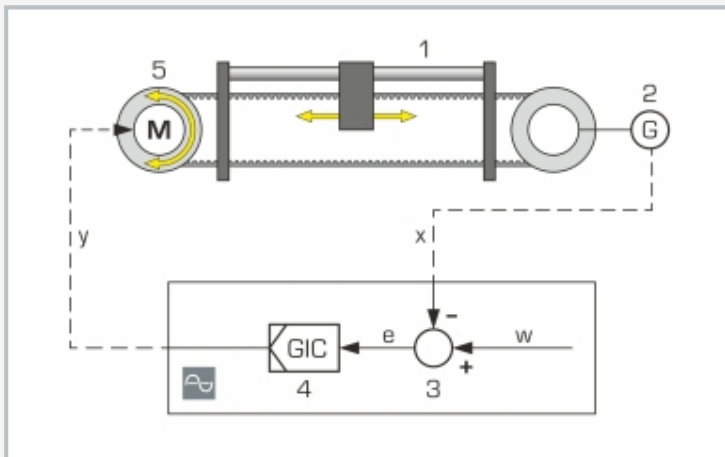
- fundamentals of control engineering using the example of a position controlled system
- open control loop response
- controlled system without feedback
- effects of different controller parameters and methods on the closed loop system response
- controller optimisation by changing the controller parameters: K_p , T_n , T_v
- recording of step responses: manipulating variable step and reference value step
- manipulating variable limitation and effect on the control system
- 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
- recording of time dependencies
- remote learning: software simulation at any number of workstations

RT 060

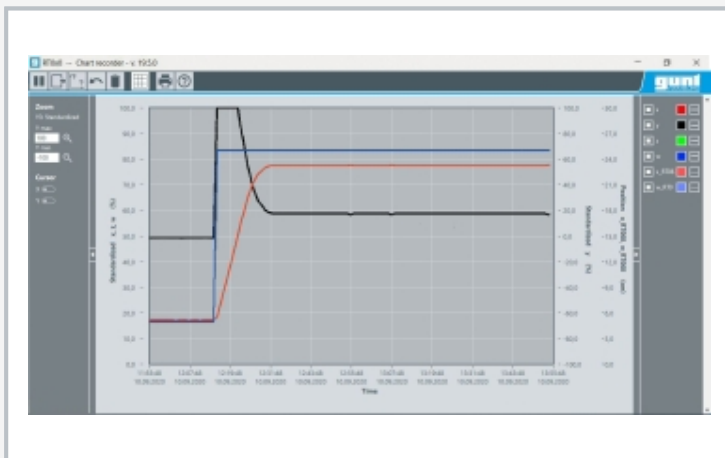
Training system position control, HSI



1 displays and controls, 2 multi-turn potentiometer as rotary encoder, 3 moving slide, 4 toothed belt, 5 steel scale, 6 motor



1 controlled system: moving slide with linear track, 2 measuring element: rotary encoder (multi-turn potentiometer), 3 comparator: part of the GUNT software, 4 software controller, 5 actuator: motor
 x controlled variable: position, y manipulating variable: motor trigger voltage, w reference value: input values, e control deviation, G position



Software screenshot: position control with P controller, reference value step with persistent control deviation in the controlled variable

Specification

- [1] position control: typical controlled system
- [2] controlled system: moving slide with linear track
- [3] controlled variable: position of the moving slide
- [4] measuring element: rotary encoder (multi-turn potentiometer) as position sensor
- [5] software controller can be configured and parametrised as P, PI, PID and switching controller
- [6] actuator: motor
- [7] steel scale for observing the position
- [8] transparent protective cover over the experimental setup
- [9] 2 microswitches for end position shut-off
- [10] software simulation: various controlled systems
- [11] GUNT software: option to connect any number of external workstations on the local network to follow and analyse the experiment
- [12] experiment preparation and software simulation at any number of workstations for remote learning
- [13] GUNT software with control functions and data acquisition via USB under Windows 10
- [14] multimedia instructional materials online in GUNT Media Center

Technical data

- Motor
- operating voltage: 12VDC
 - transmission ratio: $i=50$
 - speed: 85min^{-1}
 - torque: 200Nmm

Rotary encoder: multi-turn potentiometer

max. travel speed: 45mm/s
 Steel scale: 0...300mm

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

Measuring ranges

- travel: max. 300mm

230V, 50Hz, 1 phase
 230V, 60Hz, 1 phase
 120V, 60Hz, 1 phase
 UL/CSA optional
 LxWxH: 600x450x280mm
 Weight: approx. 20kg

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

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Training system position control, HSI

Optional accessories

WP 300.09

Laboratory trolley