

# RT 020

Training system: flow control, HSI



## Description

- **experimental unit with clear flow control system**
- **extensive range of experiments on fundamentals of control engineering**
- **state-of-the-art software for all experimental units of the RT 010 – RT 060 series, with extensive controller and recorder functions**
- **software-based simulation of the controlled system**

This compact experimental unit offers every opportunity to learn the fundamentals of control engineering through experimentation on a flow control system. The experimental setup is mounted in a housing which accommodates all the electronics.

A piping system with two flow meters is supplied with flow by a speed-controlled pump from the transparent storage tank. The rotameter offers the advantage that the flow rate can be observed

directly at any time. The flow rate is measured by a turbine wheel flow sensor. The sensor output signal is sent to the software controller. The output signal from the controller influences the setting of an electromagnetic proportional valve. To investigate the influence of disturbance variables, the pump speed can be altered by way of the software.

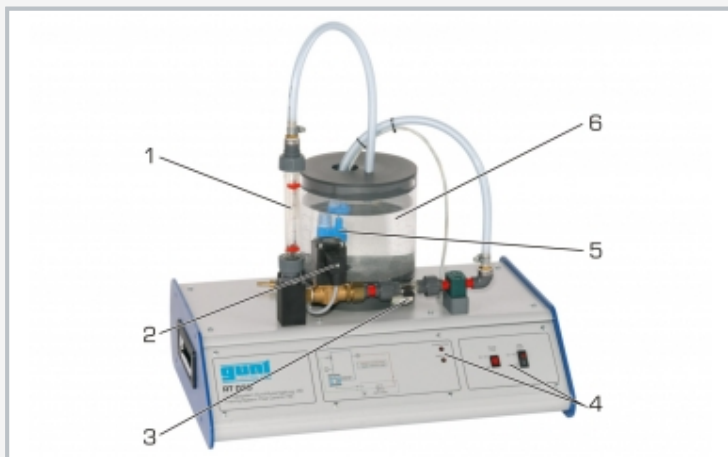
The powerful state-of-the-art software is an integral part of the training system, embodying the principle of hardware/software integration (HSI). It enables the experiments to be conducted and evaluated in a user-friendly manner. The software has network capability. The link between the experimental unit and the PC is made via a USB port.

## Learning objectives/experiments

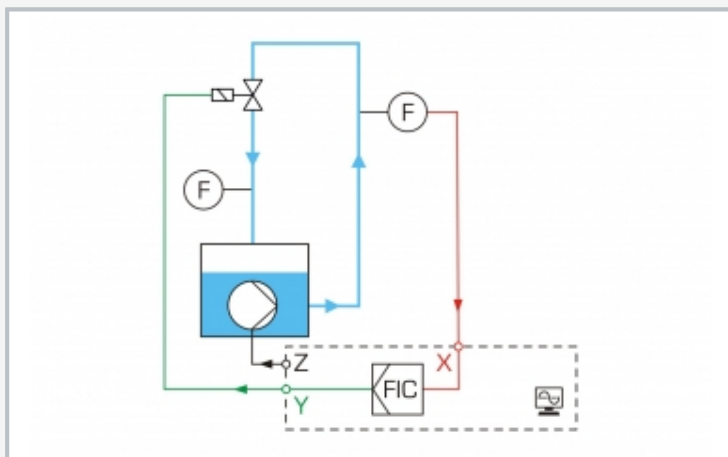
- **fundamentals of control engineering based on the example of a rapid flow control system open loop control response**
- **effects of different controller parameters and methods on the response of the closed loop system**
- **recording of step responses**
  - ▶ reference variable
  - ▶ disturbance variable
- **controller optimisation**
- **software-based controlled system simulation**
  - ▶ comparison of different controlled system parameters

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1 rotameter, 2 proportional valve, 3 flow sensor, 4 displays and controls, 5 pump, 6 storage tank



Process schematic



Software screenshot: flow control, controller with PI response with different values for  $K_p$  and  $T_i$ , introduction of a disturbance variable

### Specification

- [1] experimental unit for control engineering experiments
- [2] flow control system with variable-area flow meter
- [3] electromagnetic proportional valve as actuator
- [4] turbine wheel flow sensor
- [5] generation of disturbance variables by altering pump speed
- [6] software-based controlled system simulation
- [7] process schematic on front panel
- [8] networkable GUNT software
- [9] GUNT software with control functions and data acquisition via USB under Windows 7, 8.1, 10

### Technical data

#### Storage tank

- capacity: approx. 3000mL

#### Pump

- power consumption: 18W
- max. flow rate: 8L/min
- max. head: 6m

#### Rotameter: 20...250L/h

#### Proportional valve: $K_{vs}$ : 0,7m<sup>3</sup>/h

#### Flow sensor: 0,5...3L/min

Software controller configurable as P, PI, PID and switching controller

#### Software

- process schematic with controller type selection (manual, continuous controller, two- or three-point controller, programmer)
- time functions
- simulation function
- disturbance variable input

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 600x450x600mm

Weight: approx. 21kg

### Scope of delivery

- 1 experimental unit
- 1 hose
- 1 GUNT software CD + USB cable
- 1 handbook: fundamentals of control engineering (RT 010 – RT 060)
- 1 manual for RT 020

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Optional accessories

020.30009

WP 300.09

Laboratory trolley