

# RT 552

## pH value control trainer



The illustration shows a similar unit.

### Learning objectives/experiments

- fundamentals of control engineering
- real industrial control engineering components
- operation and parameterisation of the local controller
  - ▶ manually
  - ▶ using the RT 650.50 process control software
- pH value control
  - ▶ influence of dead time
- ratio control
- investigation of disturbance and control response
- controller optimisation
- properties of the open and closed control loops
- processing of process variables using external equipment, e.g. oscilloscope or plotter
  
- together with accessory RT 650.50 and other trainers (RT 512 – RT 542): familiarisation with and use of process control software (SCADA)

### Description

- experimental introduction to control engineering using an example of continuous pH value control
- construction of the system with components commonly used in industry
- digital controller with freely selectable parameters: P, I, D and all combinations
- integrated 2-channel line recorder
- optional process control software RT 650.50 available
- construction of a complete networked system via Profibus interface possible

This trainer provides a comprehensive experimental introduction to the fundamentals of control engineering using an example of continuous pH control.

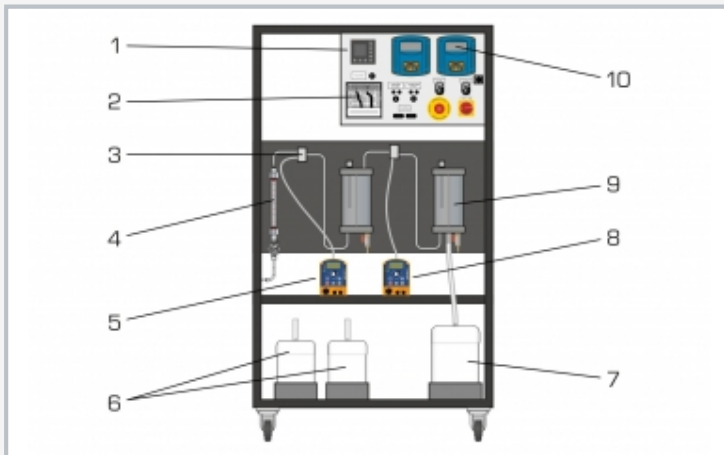
A caustic solution is added to fresh water by way of a metering pump. The pH value of this solution is measured. The acid is then added to the solution as a neutralising reagent by way of a second metering pump. The chemical reaction occurs in a pipeline system. The pH value is then re-measured. A state-of-the-art digital industrial controller controls the second metering pump with reference to this pH value. The neutralised solution flows into the product tank. A third manual measurement of the pH value in the product tank permits disposal of solution with a neutral pH value. The pH value of the input solution can be varied by manually adjusting the metering pump or by varying the quantity of fresh water. This enables disturbances to be simulated. The controlled variable X and the manipulating variable Y are plotted directly on an integrated 2-channel line recorder. Alternatively, the variables can be tapped as analogue signals at lab jacks on the switch cabinet.

This enables external recording equipment, such as an oscilloscope or a flatbed plotter, to be connected.

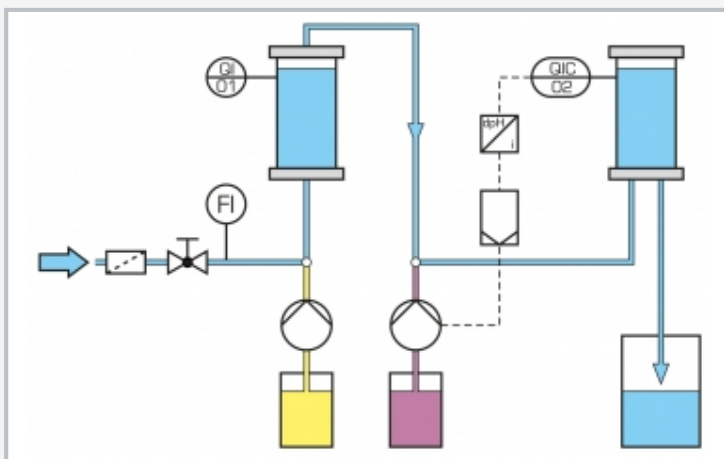
A process control software (RT 650.50) is optionally available. The software permits the construction of a complete networked system comprising multiple trainers from the RT 512 – RT 552 series. The key process variables can also be represented, and control functions executed.

# RT 552

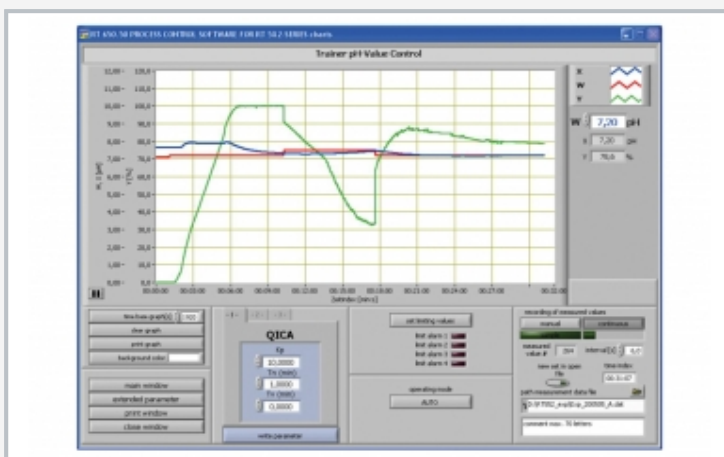
## pH value control trainer



1 controller, 2 line recorder, 3 mixing nozzle, 4 rotameter (fresh water), 5 manually adjustable caustic metering pump, 6 chemicals tank, 7 product tank, 8 controller-adjusted acid metering pump, 9 product tank, 10 pH value display



Process schematic



Screenshot of optional process control software RT 650.50: step response to change in reference variable, PI controller

### Specification

- [1] trainer for control engineering experiments
- [2] pH value control process, equipped with standard industrial components
- [3] neutralisation of a caustic solution with an acid
- [4] 2 pH value sensors in transparent measuring tanks with overflow
- [5] digital controller, parameterisable as a P, PI or PID controller
- [6] product tank and 2 chemicals tanks
- [7] 2 metering pumps: adjustable manually or via controller
- [8] water connection with control valve and rotameter
- [9] corrosion-resistant piping system
- [10] hand-held pH-meter for product control
- [11] 2-channel line recorder
- [12] process variables X and Y accessible as analogue signals via lab jacks

### Technical data

- Product tank: 20L
- Chemicals tank: 2x 5L
- Metering pumps
  - max. flow rate: each 2,1L/h
  - max. head: each 160m
- pH value sensor
  - filled with solid electrolyte
  - with glass shaft and PTFE diaphragm
- Line recorder
  - 2x 4...20mA
  - feed rate 0...7200mm/h, stepped
- Controller
  - process variables X, Y as analogue signals: 4...20mA

- Measuring ranges
  - pH value: 1...12
  - temperature: 0...80°C

- 230V, 50Hz, 1 phase
- 230V, 60Hz, 1 phase
- 120V, 60Hz, 1 phase
- UL/CSA optional
- LxWxH: 1000x700x1750mm
- Weight: approx. 105kg

### Required for operation

- Water connection
- Caustic soda NaOH 45%; hydrochloric acid HCl 30%, technically pure; buffer solution pH 4,0 (red), buffer solution pH 7,0 (green), buffer solution pH 10,0 (blue)

### Scope of delivery

- 1 trainer
- 1 hand-held pH-meter
- 3 measuring cups
- 1 set of cables
- 1 hose
- 1 set of instructional material

# **RT 552**

## **pH value control trainer**

Optional accessories

080.65050      RT 650.50      Process Control Software for RT 512 - RT 552 Series