

RT 578 Control of 4 Variables from Process Engineering


* **Practical control of level, flow rate, pressure and temperature**

* **Cascade control**

* **Process control software**

Technical Description

The RT 578 facilitates practical learning in the control of four controlled variables which are commonplace in process engineering.

A circuit with a graduated transparent tank is provided for the control of flow rate, level and pressure. Two actuator possibilities are included for use, namely, a variable-speed pump and a pneumatic control valve. A disturbance variable can be generated by a valve in the tank outlet for level and pressure control. A valve at the tank head also permits investigation of level control with and without counter pressure.

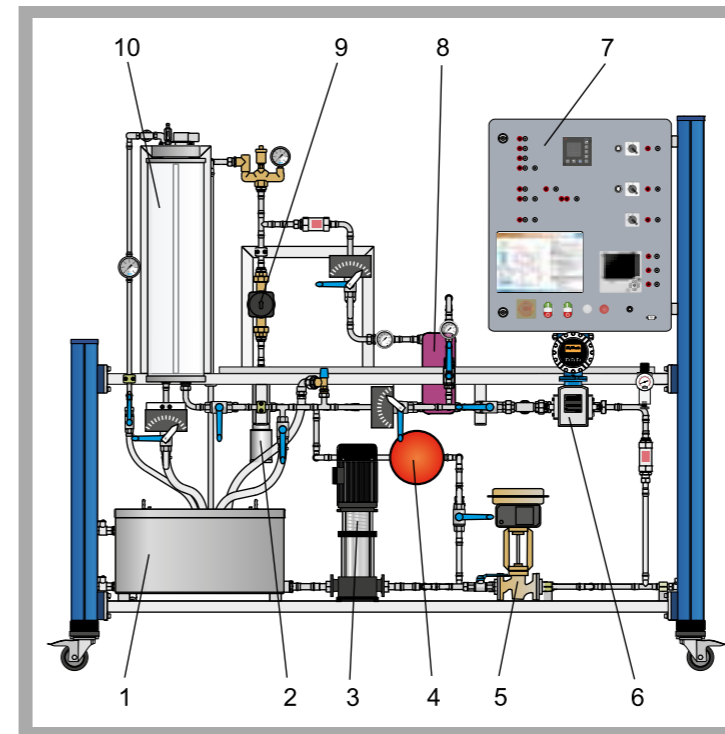
A heating circuit with a heater, heat exchanger and pump is provided for temperature control. The temperature can be controlled using the heater as the actuator, or by way of the flow of cooling water through the heat exchanger.

Two forms of cascade control are possible. The level in the tank can be controlled by way of the flow rate. The temperature in the heating circuit can be controlled by way of the flow rate through the heat exchanger. For these two cascade controls, either the pump or the control valve can be used as the actuator.

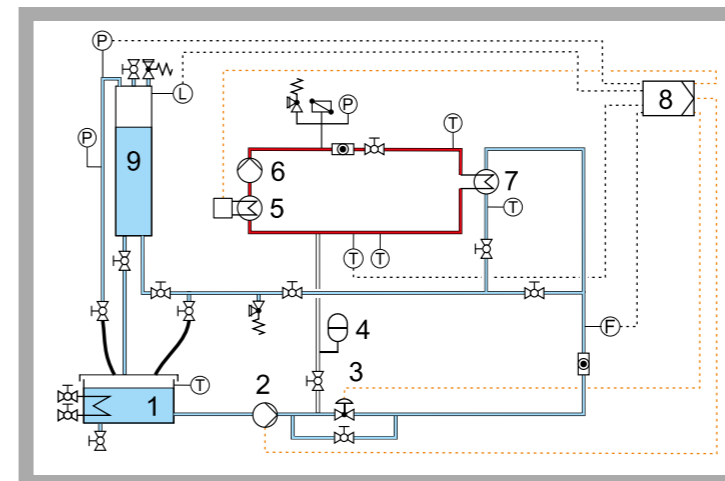
Sensors provide for measurement of the controlled variables. The variables can also be read-off directly from analogue meters. A line recorder is provided to record the control processes. The industrial controller has four selectable control loops. It has a Profibus DP interface. This enables the trainer to be controlled by way of a process control software. The software also permits recording of the process variables and parameterisation of the controller on the PC.

Learning Objectives / Experiments

- familiarisation with industrial control loop components
- setup, parameterisation and configuration on the controller
- optimisation of controller settings
- flow rate control
- level control in closed tank with or without counter pressure
- pressure control
- temperature control
- cascade control, level - flow rate
- cascade control, temperature - flow rate
- two-point control, temperature
- plotting step responses

RT 578 Control of 4 Variables from Process Engineering


1 collecting tank, 2 heater, 3 pump, 4 expansion vessel, 5 control valve, 6 flow rate sensor, 7 switch cabinet, 8 heat exchanger, 9 heating circuit pump, 10 graduated tank



1 collecting tank, 2 pump, 3 control valve, 4 expansion vessel, 5 heater, 6 heating circuit pump, 7 heat exchanger, 8 controller, 9 graduated tank;
Sensors: F flow rate, P pressure, L level, T temperature

Specification

- [1] control of level, flow rate, pressure, temperature and cascade control
- [2] circuit with collecting tank, graduated tank, pneumatic control valve and 6-stage variable-speed centrifugal pump
- [3] heating circuit with heater, pump, expansion vessel and heat exchanger
- [4] heater, pneumatic control valve and 6-stage variable-speed centrifugal pump as actuators
- [5] sensors for measurement of the controlled variables; level, flow rate, pressure and temperature
- [6] 2 flow indicators, 1 manometer and 3 thermometers for direct display
- [7] parameterisable controller with 4 selectable control loops
- [8] 3-channel line recorder
- [9] GUNT process control software via Profibus DP interface under Windows 7

Technical Data
Tanks

- graduated tank: approx. 6L
- collecting tank: approx. 90L

6-stage centrifugal pump

- max. flow rate: approx. 55L/min
- max. head: approx. 60m

Heating circuit pump

- max. flow rate: approx. 50L/min
- max. head: approx. 3,5m

Heater power output: approx. 2kW
Controller parameterisable as

- P, PI or PID controller
- switching controller

Sensor measuring ranges

- level: 0...700mm
- flow rate: 0...4000L/h
- pressure: 0...6bar
- temperature: 0...200°C

Dimensions and Weight

LxWxH: 2260x800x1990mm

Weight: approx. 250kg

Required for Operation

230V, 50/60Hz, 1 phase or 230V, 60Hz/CSA, 3 phase compressed air: 3...8bar; 25...50L/min

Scope of Delivery

- 1 trainer
- 1 set of cables
- 1 set of hoses
- 1 Profibus card
- 1 GUNT software CD
- 1 set of instructional material

Order Details

080.57800 RT 578 Control of 4 Variables from Process Engineering

RT 580

Fault Finding in Control Systems



- * Practical control of level, flow rate and temperature
- * Simulation of typical faults
- * PLC to monitor safety devices
- * Refrigeration system for independent cold supply

Technical Description

The RT 580 facilitates practical learning in the control of three controlled variables which are commonplace in process engineering.

A circuit with a collecting tank, pump and graduated tank is provided for control of level and flow rate. A pneumatic control valve is used as the actuator. There is a valve in the tank outlet to generate a disturbance variable in level control. Cascade control is possible whereby the level in the tank is controlled by way of the flow rate.

Two circuits are used in the control of the temperature. A refrigeration system cools the water in the collecting tank. A pump circulates the water via a heat exchanger (cooling circuit). A heater heats the water in the graduated tank. Another pump also circulates the warm water via the heat exchanger. In the heat exchanger the water in the cooling circuit is heated. The controlled variable is the temperature of the water in the cooling circuit after heating in the heat exchanger. The actuator is the pneumatic control valve which adjusts the flow rate of the warm water. Cascade control is also possible to control the temperature.

Two industrial controllers are supplied which can be employed as the master and slave in the implementation of cascade control. They have a Profibus DP interface. This enables the trainer to be controlled by way of a software. The software also permits recording of the process variables and parameterisation of the controllers on the PC.

The trainer is equipped with a PLC for monitoring of safety devices, such as a low water cut-off which protects the heater. On the switch cabinet there are also pushbuttons for the simulation of typical faults

such as failure of sensors or cable breaks.

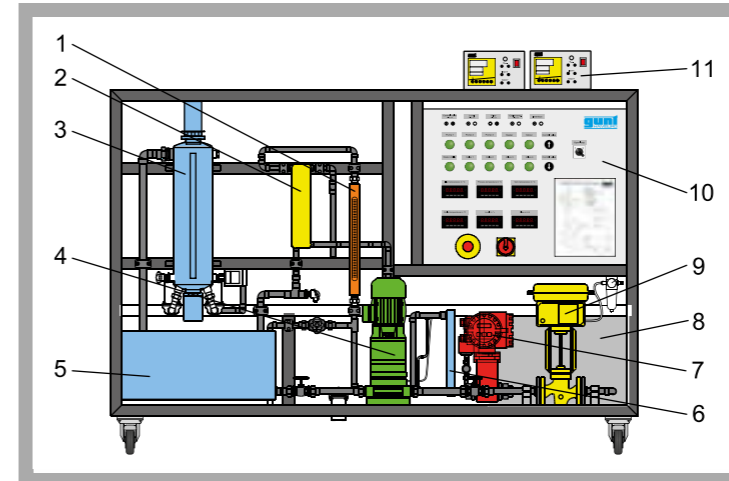
The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

Learning Objectives / Experiments

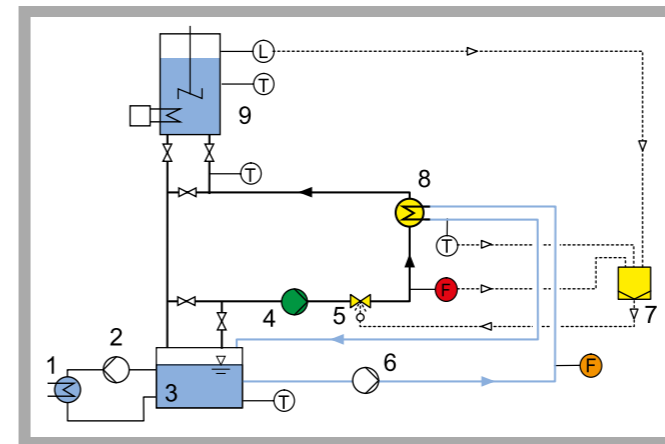
- familiarisation with industrial control loop components
- setup, parameterisation and configuration on the controller
- optimisation of controller settings
- level control
- flow rate control
- temperature control
- cascade control, level - flow rate
- cascade control, temperature - flow rate
- plotting step responses
- fault finding

RT 580

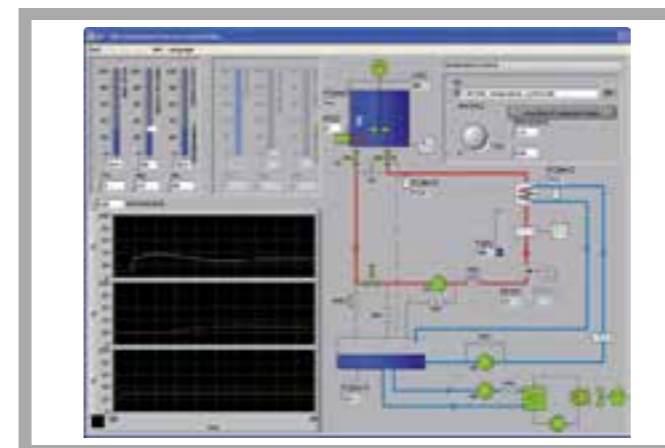
Fault Finding in Control Systems



1 flow meter, 2 heat exchanger, 3 stirred tank with heater, 4 main circuit pump, 5 collecting tank, 6 refrigeration system evaporator, 7 flow rate sensor, 8 refrigeration system, 9 control valve, 10 switch cabinet, 11 controller



1 refrigeration system evaporator, 2 refrigeration system pump, 3 collecting tank, 4 main circuit pump, 5 control valve, 6 cooling circuit pump, 7 controller, 8 heat exchanger, 9 stirred tank with heater; F flow rate, L level, T temperature



Process control software screenshot

Specification

- [1] control of level, flow rate, temperature and cascade control
- [2] main circuit with collecting tank, graduated stirred tank with heater, pneumatic control valve and centrifugal pump
- [3] cooling circuit with pump, heat exchanger and rotameter
- [4] refrigeration system and pump to cool the water in the collecting tank
- [5] pneumatic control valve in main circuit as actuator for all controls
- [6] sensors for the measurement of the controlled variables; level, flow rate and temperature
- [7] 2 parameterisable industrial controllers
- [8] 6 pushbuttons for fault simulation
- [9] PLC to monitor safety devices
- [10] GUNT process control software via Profibus DP interface under Windows Vista or Windows 7

Technical Data

Tanks

- stirred tank with scale: approx. 7L
- collecting tank: approx. 90L

Main circuit centrifugal pump

- max. flow rate: approx. 75L/min
- max. head: approx. 20m

2 pumps, cooling circuit and refrigeration system

- max. flow rate: approx. 60L/min
- max. head: approx. 4m
- Heater power output: approx. 2kW
- Controller parameterisable as
- P, PI or PID controller

Measuring ranges

- level: 0...350mm
- flow rate: 0...1999L/h
- temperature: 0...100°C

Dimensions and Weight

LxWxH: 1920x800x1530mm

Weight: approx. 245kg

Required for Operation

230V, 50/60Hz, 1 phase or 230V, 60Hz, 3 phases
compressed air: 3...8bar; 25...50L/min

Scope of Delivery

- 1 trainer
- 2 controllers
- 1 set of cables
- 1 Profibus card
- 1 CD with PLC programming software
- 1 GUNT software CD
- 1 set of instructional material

Order Details

080.58000 RT 580 Fault Finding in Control Systems

RT 450 Process Automation Training System: Base Module



Technical Description

Together with its wide-ranging accessory components, the RT 450 base module provides a modular, fully flexible and open-design system for learning the fundamentals of process automation by means of experimentation. The accessory components are pre-installed on panels. The base module provides an extensive frame for quick and safe mounting of the components required for the various experiments. It includes a water supply with tank and pump, a switch cabinet for power supply as well as connections, maintenance units, and a pressure regulator for an external compressed air supply.

Connecting up the measuring and control cables and the process lines, as well as connection to the electricity supply, form key elements of the programme of exercises. Alongside the purely systematic technical learning content involved, key aspects of the teaching goals are pre-planning, modification, testing, commissioning and optimisation.

Optimal learning is achieved when two or three students work together on a training system as a group.

An instrumentation and control software (RT 450.40) with an interface module for Profibus DP (RT 450.41) is available as an accessory. This enables the key process variables to be displayed and control functions to be executed.

The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

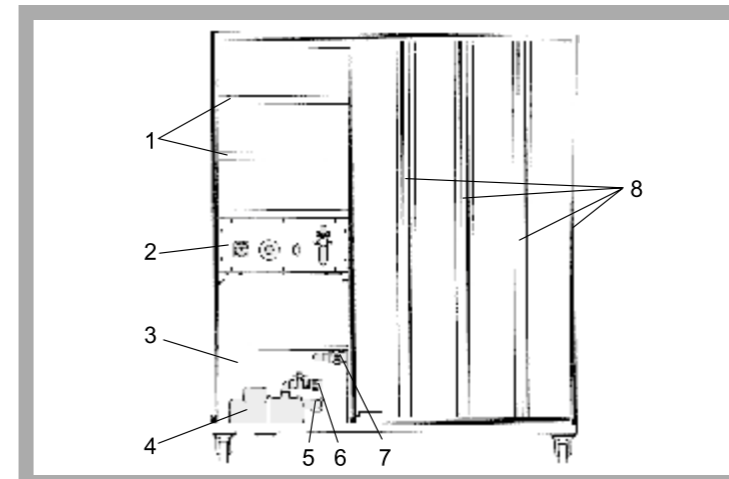
Learning Objectives / Experiments

Together with accessory components, the following learning content and exercises are possible

- planning and construction of different process applications
- planning and construction of different automation solutions for the control systems
- familiarisation with the design, function and behaviour of industrial automation components, such as controllers, PLCs, actuators and measuring devices
- commissioning and optimisation of automated process applications
- making process connections (via pipes/hoses), connecting up the electricity supply and the instrumentation and control components
- fundamentals of the use of data acquisition, system control and parameter setting using the RT 450.40 software

- * **Modular training system providing an introduction to the fundamentals of process automation**
- * **Base module with large frame for preassembled components**
- * **Extensive range of accessories available: process application modules, sensors, actuators, controllers, PLCs etc.**
- * **Software for data acquisition, operator control and parameter setting optionally available**

RT 450 Process Automation Training System: Base Module



1 frame for electrical modules, 2 switch cabinet with power supply and maintenance and pressure control unit for compressed air, 3 storage tank, 4 centrifugal pump, 5 pump outlet, 6 pump inlet, 7 system water return, 8 aluminium frame



The illustration shows the layout of a level control system. In addition to the base module RT 450, it includes the following components: RT 450.01 (controlled system module: level), RT 450.10 (controller), RT 450.12 (recorder), RT 450.21 (control valve) and RT 450.35 (level sensor).



RT 450.10 (controller), RT 450.12 (recorder) and RT 450.42 (PLC module)

Specification

- [1] base module for a flexible process automation training system
- [2] large frame with aluminium rails
- [3] frame for electrical modules
- [4] water circuit with centrifugal pump and tank
- [5] switch cabinet with 24V power supply
- [6] practice-oriented terminal blocks for wiring of the instrumentation and control signals
- [7] 2x maintenance unit and a pressure regulator for compressed air
- [8] installation and connecting material including tools for connecting accessory modules

Technical Data

Stainless steel storage tank: 75L
Centrifugal pump
- max. head: 20m
- max. flow rate: 5,4m³/h
- power consumption: 370W
24VDC supply for components

Dimensions and Weight

LxWxH: 1650x850x1950mm
Weight: approx. 120kg

Required for Operation

230V, 50/60Hz, 1 phase or 120V, 60Hz/CSA, 1 phase
Compressed air supply for RT 450.03, RT 450.20 or RT 450.21: 6...10bar

Scope of Delivery

- 1 base module with pump, tank and switch box
- 1 accessory set (tools, compressed air hose, plastic tube, single-core non-sheathed cable, connecting elements)
- 1 set of instructional material

Order Details

080.45000 RT 450 Process Automation Training System: Base Module

RT 450 Process Automation Training System: Base Module

Available Accessories:

CONTROLLED SYSTEM MODULES:

Product no. Order details

- 080.45001 RT 450.01 Controlled System Module: Level
- 080.45002 RT 450.02 Controlled System Module: Flow
- 080.45003 RT 450.03 Controlled System Module: Pressure
- 080.45004 RT 450.04 Controlled System Module: Temperature

CONTROLLER AND RECORDER MODULES:

Product no. Order details

- 080.45010 RT 450.10 Continuous Controller Module
- 080.45011 RT 450.11 Switching Controller Module
- 080.45012 RT 450.12 Chart Recorder Module
- 080.45013 RT 450.13 Digital Display
- 080.45042 RT 450.42 PLC Module with Software

recommended accessory for controller modules:

- 080.45014 RT 450.14 Software for Controller Configuration

CONTROL VALVES:

Product no. Order details

- 080.45020 RT 450.20 Control Valve, Pneumatically Driven, Kvs 0,4
- 080.45021 RT 450.21 Control Valve, Pneumatically Driven, Kvs 1,0
- 080.45023 RT 450.23 Control Valve, Electrically Driven, Kvs 0,4
- 080.45024 RT 450.24 Control Valve, Electrically Driven, Kvs 1,0

SENSORS:

Product no. Order details

- 080.45030 RT 450.30 Pressure Sensor, 0...6bar
- 080.45031 RT 450.31 Pressure Sensor, 0...2bar
- 080.45032 RT 450.32 Pressure Sensor, 0...100mbar
- 080.45033 RT 450.33 Orifice with Differential Pressure Sensor
- 080.45034 RT 450.34 Flow Rate Sensor: Electromagnetic
- 080.45035 RT 450.35 Level Sensor: Capacitive
- 080.45036 RT 450.36 Temperature Sensor Pt100
- 080.45037 RT 450.37 Thermocouple (K) with Head Transmitter

PC CONNECTION:

Product no. Order details

- 080.45040 RT 450.40 Visualisation Software

required accessory for usage of Visualisation Software:

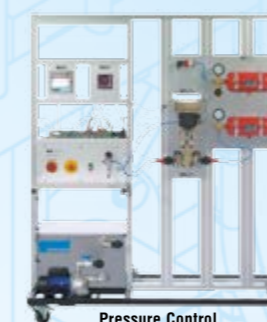
- 080.45041 RT 450.41 Profibus DP Module for Controller
- or
- 080.45043 RT 450.43 Profibus DP Module for PLC

G.U.N.T Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Phone +49 (40) 67 08 54-0, Fax +49 (40) 67 08 54-42, E-mail sales@gunt.de, Web http://www.gunt.de
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RT 450 MODULAR TRAINING SYSTEM: PROCESS AUTOMATION SELECTION OF COMPONENTS, ACCESSORIES, ALTERNATIVES



Level Control



Pressure Control



Flow Control



Temperature Control

LEVEL CONTROL

RT 450.01 Controlled System Module: Level

- RT 450 Process Automation Training System: Base Module
- RT 450.21 Control Valve, Pneumatically Driven, Kvs 1,0
- RT 450.10 Continuous Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.24 Control Valve, Electrically Driven, Kvs 1,0
- RT 450.11 Switching Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.35 Level Sensor: Capacitive
- RT 450.32 Pressure Sensor, 0...100mbar ALTERNATIVELY

FLOW CONTROL

RT 450.02 Controlled System Module: Flow

- RT 450 Process Automation Training System: Base Module
- RT 450.21 Control Valve, Pneumatically Driven, Kvs 1,0
- RT 450.10 Continuous Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.24 Control Valve, Electrically Driven, Kvs 1,0
- RT 450.11 Switching Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.34 Flow Rate Sensor: Electromagnetic
- RT 450.33 Orifice with Differential Pressure Sensor ALTERNATIVELY

PRESSURE CONTROL

RT 450.03 Controlled System Module: Pressure

- RT 450 Process Automation Training System: Base Module
- RT 450.20 Control Valve, Pneumatically Driven, Kvs 0,4
- RT 450.10 Continuous Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.23 Control Valve, Electrically Driven, Kvs 0,4
- RT 450.11 Switching Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.30 Pressure Sensor, 0...6bar

TEMPERATURE CONTROL

RT 450.04 Controlled System Module: Temperature

- RT 450 Process Automation Training System: Base Module
- RT 450.21 Control Valve, Pneumatically Driven, Kvs 1,0
- RT 450.10 Continuous Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.24 Control Valve, Electrically Driven, Kvs 1,0
- RT 450.11 Switching Controller Module
- RT 450.42 PLC Module with Software ALTERNATIVELY
- RT 450.36 Temperature Sensor Pt100
- RT 450.37 Thermocouple (K) with Head Transmitter ALTERNATIVELY

OPTIONAL ACCESSORIES

- RT 450.12 Chart Recorder Module
- RT 450.13 Digital Display
- RT 450.40 Visualisation Software
- RT 450.41 Profibus DP Module for Controller
- RT 450.43 Profibus DP Module for PLC ALTERNATIVELY

RECOMMENDED ACCESSORY

- RT 450.14 Software for Controller Configuration

RT 450.01 Controlled System Module: Level



Specification

- [1] level control loop setup (in conjunction with other modules from the RT 450 series)
- [2] ready-to-install compact panel assembly
- [3] transparent glass tank with overflow, drain valve and manometer
- [4] glass tank can be hermetically sealed
- [5] plexiglass protective sleeve
- [6] PVC tank base and cover
- [7] adjustable safety valve
- [8] fitting for attaching pressure sensor or level sensor
- [9] water as the working medium, supply via base module RT 450
- [10] cascade control option in conjunction with RT 450.02

Technical Data

Tank

- capacity: max. 7L
- filling level: max. 475mm
- operating pressure: max. 2bar

Manometer: 0...2,5bar
Safety valve: 1...4bar adjustable

Dimensions and Weight

LxWxH: 510x330x800mm
Weight: approx. 30kg

Scope of Delivery

1 level tank mounted on panel, complete with valves, taps, rapid action couplings for fitting sensors, protective sleeve and manometer

*** Main element in constructing a level control loop**

Technical Description

The RT 450.01 consists of a clear plastic level tank as the principle element and uses water as the working medium. The tank is set up in such a way that it is hermetically sealed if all taps and valves are closed. This enables experiments to be performed with the tank under internal pressure. For safety, the level tank is fitted with a safety valve and is enclosed in a transparent plastic protective sleeve. The tank includes fittings for the attachment of a pressure sensor (RT 450.31) or a level sensor (RT 450.35). It is installed in the base module RT 450. A control valve (e.g. RT 450.21) and a controller (RT 450.10) complete the control loop.

Learning Objectives / Experiments

- setting up a level control loop
- comparison of different sensors for level measurement
- level control against trapped-air cushion
- level / flow cascade control (with RT 450.02)

Order Details

080.45001 RT 450.01 Controlled System
Module: Level

G.U.N.T Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Phone +49 (40) 67 08 54-0, Fax +49 (40) 67 08 54-42, E-mail sales@gunt.de, Web http://www.gunt.de
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RT 450.02 Controlled System Module: Flow



Specification

- [1] flow control loop setup (in conjunction with other modules from the RT 450 series)
- [2] ready-to-install compact panel assembly
- [3] rotameter with scale
- [4] stop valve in the inlet section
- [5] water as the working medium, supply via base module RT 450
- [6] optional cascade control in conjunction with RT 450.01

Technical Data

Rotameter: 0...2,5m³/h

Dimensions and Weight

LxWxH: 250x180x700mm
Weight: approx. 10kg

Scope of Delivery

1 rotameter mounted on panel, complete with stop valve and connections

*** Main element in constructing a flow control loop**

Technical Description

The RT 450.02 consists of a rotameter as the principle element and uses water as the working medium. A valve can be used to adjust the flow resistance and thus change the flow properties of the controlled system.

A major advantage of this controlled system is that the rotameter allows all changes in the flow rate caused by faults or responses to a control action to be directly observed.

A control loop for flow control experiments is set up using the base module RT 450, a control valve (RT 450.2x), the RT 450.10 controller and a sensor (e.g. RT 450.34).

Learning Objectives / Experiments

- setting up of a flow control loop
- comparison of different sensors for flow measurement
- level / flow cascade control (with RT 450.01)

Order Details

080.45002 RT 450.02 Controlled System
Module: Flow

G.U.N.T Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Phone +49 (40) 67 08 54-0, Fax +49 (40) 67 08 54-42, E-mail sales@gunt.de, Web http://www.gunt.de
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RT 450.03 Controlled System Module: Pressure



Technical Description

The RT 450.03 controlled system module is a panel-mounted ready-to-install element. In conjunction with other modular control components, it enables pressure control systems with different characteristic features to be constructed and investigated.

The panel is mounted on the frame of the base module RT 450. RT 450.03 consists of two steel pressure tanks and is operated with compressed air as the working medium. Each tank is fitted with a manometer and a safety valve. One tank also has a drain valve. Both tanks can be fitted with a pressure sensor. The tanks are interconnected by a vent valve and can therefore be connected in series. This makes it possible to represent both first and second order pressure control systems.

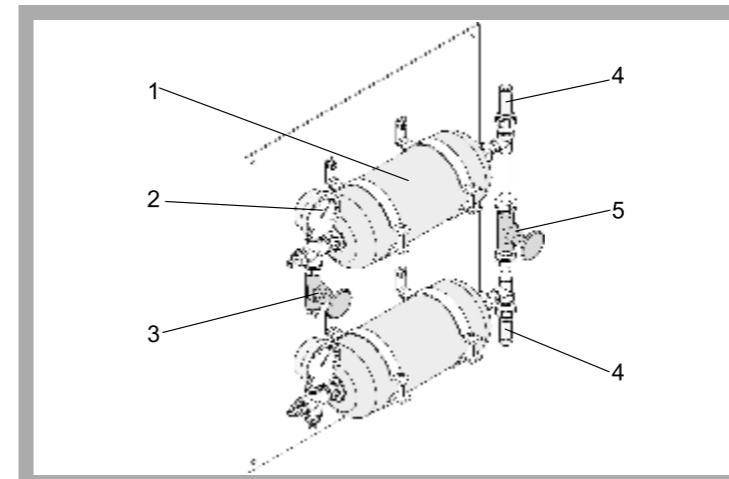
The RT 450 base module supplies the controlled system module with its working compressed air. Pneumatic hoses with quick-release couplings connect all the modules to a pressure control loop.

Learning Objectives / Experiments

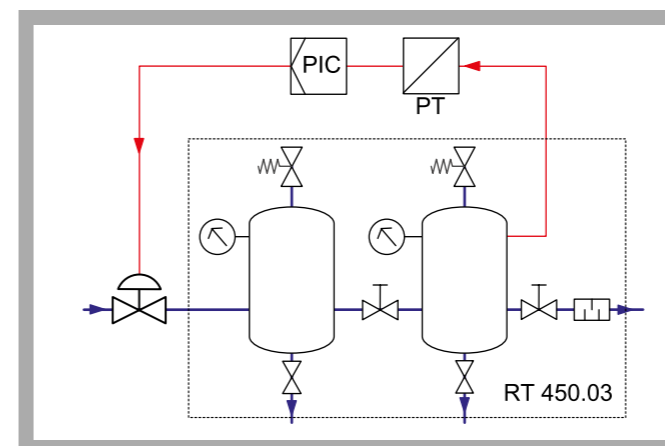
- planning, setting up, testing, optimising and assessing pressure control loops with different objectives and components
- * constructing a 1st order pressure control system
- * constructing a 2nd order pressure control system
- design and function of different instrumentation and control components
- technical terminology and symbols in industrial control engineering
- practical exercises: Implementing process and signal lines
- commissioning and troubleshooting of process engineering systems

- * Main element in constructing a pressure control loop
- * Rapid installation into the RT 450 base module by modular panel assembly

RT 450.03 Controlled System Module: Pressure



1 pressure tank, 2 manometer, 3 drain valve, 4 safety valve, 5 vent valve



Process schematic



The illustration shows the layout of a pressure control system. In addition to the base module RT 450, it includes the following components: RT 450.03 (controlled system module: pressure), RT 450.10 (controller), RT 450.12 (recorder), RT 450.20 (control valve) and RT 450.30 (pressure sensor).

Specification

- [1] construction of a pressure control loop (in conjunction with other modules of the RT 450 series)
- [2] ready-to-install compact panel assembly
- [3] 2 pressure tanks with safety valves
- [4] direct pressure indication by 2 manometers
- [5] valve permits series configuration of both pressure tanks
- [6] series configuration of pressure tanks: investigation of coupled controlled system response compared to single-tank operation
- [7] 2 valves: 1x drain, 1x vent
- [8] copper piping
- [9] compressed air as working medium, supply via base module RT 450

Technical Data

Pressure tank
 - capacity: 3L
 - operating pressure: max. 6bar
 - manometer: 0...10bar
 Safety valve: adjustable to max. 10bar

Dimensions and Weight

LxWxH: 510x175x600mm
 Weight: approx. 15kg

Required for Operation

Compressed air supply via RT 450

Scope of Delivery

2 pressure tanks mounted on panel, complete with valves and manometers

Order Details

080.45003 RT 450.03 Controlled System Module: Pressure

RT 450.04 Controlled System Module: Temperature



Technical Description

The RT 450.04 controlled system module is a panel-mounted ready-to-install element. In conjunction with other modular control components, it enables temperature control systems with different characteristic features to be constructed and investigated.

The panel is mounted on the frame of the base module RT 450. The main elements of the controlled system module are: an electric heater installed in a section of pipe, and a plate heat exchanger between the primary and secondary water circuits. The heater can either be operated by a switching controller and so act as the control loop actuator, or can operate in continuous duty as a pure energy source. In operation as a continuous controller, with the heater as the energy source, a choice of two different valves (pneumatic or electric) can be used as actuators in the primary circuit.

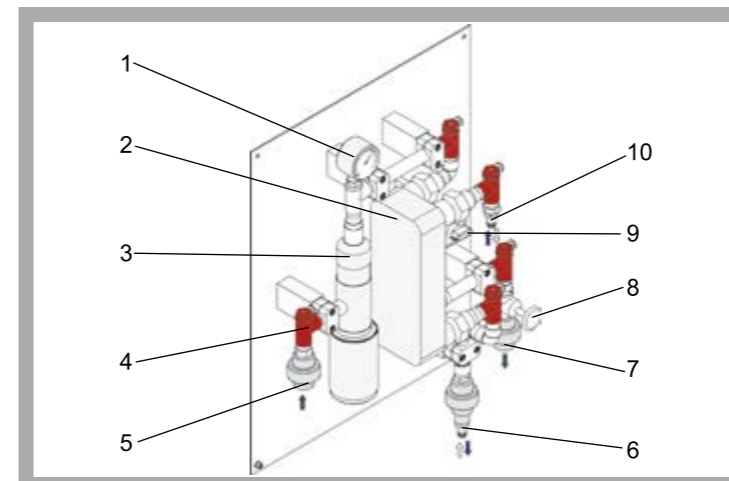
For safety, the heater features a thermostat and a device to protect it from running dry. The primary circuit (with heater) is connected by pipelines to the water supply of the base module RT 450, while the secondary circuit requires a laboratory water supply for cooling. Counterflow or parallel flow cooling is possible. The connection to the laboratory network is made by quick-release couplings and hoses.

Learning Objectives / Experiments

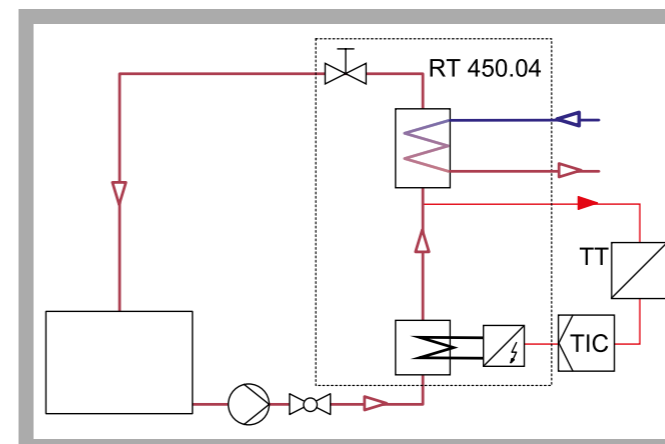
- planning, setting up, testing, optimising and assessing temperature control loops with different objectives and components
- design and function of different instrumentation and control components
- technical terminology and symbols in industrial control engineering
- practical exercises: implementing process and signal lines
- commissioning and troubleshooting of process engineering systems

- * **Main element in constructing a temperature control loop**
- * **Rapid installation into the RT 450 base module by modular panel assembly**

RT 450.04 Controlled System Module: Temperature



1 thermometer, 2 plate heat exchanger, 3 heater, 4 temperature measurement points, 5 RT 450 inlet, 6 external water circuit connection, 7 return to RT 450, 8 Regulating valve, 9 heater switch, 10 external water circuit connection



Process schematic for controlled system with heater as actuator and switching controller



The illustration shows the layout of a temperature control system. In addition to the base module RT 450, it includes the following components: RT 450.04 (controlled system module: temperature), RT 450.11 (controller), RT 450.12 (recorder), RT 450.21 (control valve) and RT 450.36 (temperature sensor).

Specification

- [1] construction of a temperature control loop (in conjunction with other modules of the RT 450 series)
- [2] ready-to-install compact panel assembly
- [3] electric heater with thermostat and dry-running protection
- [4] direct temperature display at heater outlet with bimetallic thermometer
- [5] heater is either an actuator or a continuous heater
- [6] plate heat exchanger, operating in counter-flow or parallel-current mode
- [7] primary circuit with heater and heat exchanger, connected to water supply of base module RT 450
- [8] flow of primary circuit controlled by hand-operated valve
- [9] secondary circuit of heat exchanger connected to laboratory water supply

Technical Data

- Plate heat exchanger
 - number of plates: 20
 - heat transfer surface: 0,72m²
 - flow rate: max. 3m³/h
- Heater with thermostat and dry-running protection
 - power output: 2kW
 - temperature limitation by thermostat: 65°C
- Thermometer at heater outlet: 0...100°C

Dimensions and Weight

- LxWxH: 510x200x650mm
- Weight: approx. 20kg

Required for Operation

- Water connection: max. 3m³/h

Scope of Delivery

- 1 heater and 1 plate heat exchanger mounted on panel, complete with piping, valve, safety elements, temperature sensor fixtures, connections to RT 450 piping system

Order Details

- 080.45004 RT 450.04 Controlled System Module: Temperature

HL 360

Oil tank safety trainer



Learning objectives/experiments

- oil tank with stipulated outlet, filling and safety devices
- standards, technical rules, legal requirements and regulations for the storage of heating oil
- function of tank protection devices
- filling an oil tank
- drawing oil from a tank

Description

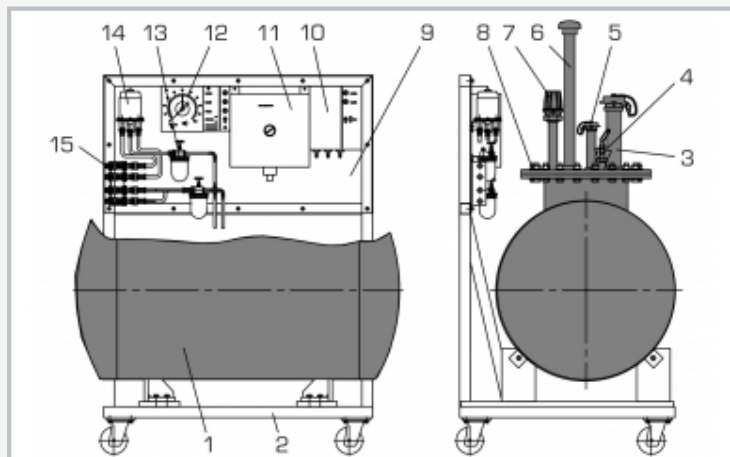
- **trainer on heating oil storage in tanks**
- **double-walled oil tank with internal protective cover**
- **investigation of tank safety devices and their function**

The system is fully functional so it is possible to use it for the supply of oil to laboratory equipment observing the local legal regulations, as well as performing the tests and demonstrations.

The trainer contains all the stipulated safety fittings and tank protection devices. The double-walled oil tank includes filling and outlet devices. Indicators such as a level gauge and a leak detector are fitted to a metal panel.

HL 360

Oil tank safety trainer



1 oil tank, 2 frame, 3 filler pipe with seal, 4 combination fitting, 5 dip stick tube with seal, 6 tank ventilation, 7 overfill protection, 8 dome cover, 9 fittings panel, 10 vacuum leak detector, 11 leak liquid tank, 12 level gauge with liquid leak detector, 13 oil filter, 14 automatic ventilation, 15 oil connections

Specification

- [1] oil tank, complete with all necessary filling, outlet and safety devices
- [2] oil tank according to DIN 6616, double-walled
- [3] pneumatic level gauge
- [4] liquid leak detection system, vacuum leak detection system
- [5] single-strand oil filter, double-strand oil filter
- [6] device for overfill protection
- [7] combination fitting
- [8] filler pipe with seal
- [9] dip stick tube with dip stick and seal
- [10] tank ventilation

Technical data

Oil tank

■ 350L

1 leak detector with tank

1 leak detector

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1200x800x1600mm

Empty weight: approx. 250kg

Scope of delivery

- 1 trainer
- 1 set of accessories
- 1 manual

HL 392C

Safety & control in heating systems



Description

■ trainer for the investigation of heating system safety fittings with data acquisition

Using the trainer various safety and control devices can be investigated and evaluated. Typical industrial components are used.

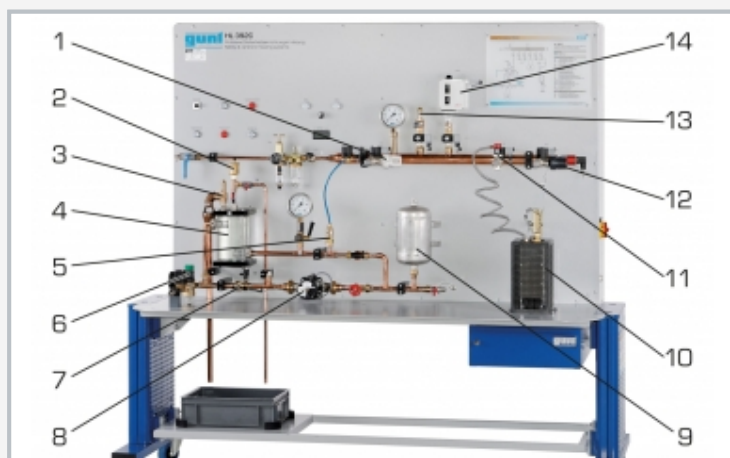
The measured values are transmitted directly to a PC via USB where they can be analysed using the software included, e.g. representation of the data in diagrams.

Learning objectives/experiments

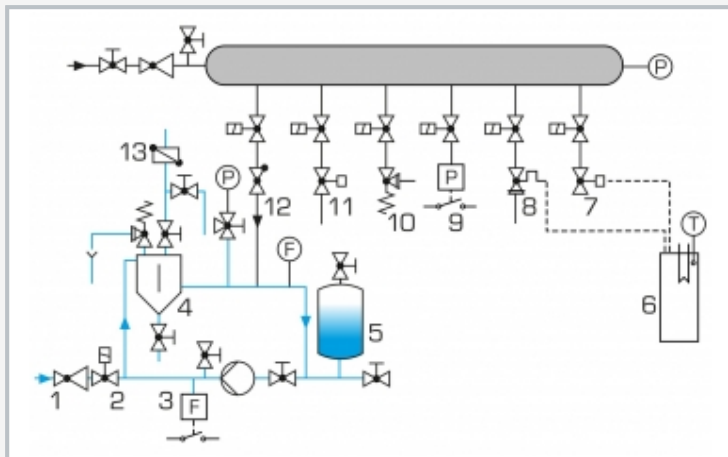
- function and operating behaviour of
 - ▶ safety valve
 - ▶ quick-action ventilating valve
 - ▶ safety pressure cut-out
 - ▶ thermal discharge safety device
 - ▶ thermostatic valve
 - ▶ temperature controller
 - ▶ air separator
 - ▶ flow switch

HL 392C

Safety & control in heating systems



1 thermostatic valve, 2 quick-action ventilating valve, 3 safety valve, 4 air separator, 5 non-return valve, 6 pressure reducing valve, 7 flow switch, 8 pump, 9 expansion vessel, 10 heater, 11 thermal discharge safety device, 12 temperature controller, 13 safety pressure cut-out, 14 safety pressure cut-out



process schematic: 1 pressure reducing valve, 2 solenoid valve, 3 flow switch, 4 air separator, 5 expansion vessel, 6 heater, 7 temperature controller, 8 thermal discharge safety device, 9 safety pressure cut-out, 10 safety valve, 11 thermostatic valve, 12 non-return valve, 13 quick-action ventilating valve; T temperature, P pressure, F flow; blue: water circuit, grey: compressed air

Specification

- [1] investigation of heating safety fittings
- [2] demonstration of the function of safety fittings using compressed air: thermostatic valve, safety pressure cut-out, safety valve, temperature controller, thermal discharge safety device
- [3] demonstration of the function of safety fittings in a closed water circuit with circulating pump and expansion vessel: air separator, quick-action ventilating valve, safety valve, flow switch, pressure reducing valve
- [4] electrical heater for thermal safety fittings: temperature controller, thermal discharge safety device
- [5] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

Thermal discharge safety device

- actuated at: 98°C

Temperature controller: 70...100°C

Safety pressure cut-out: 1...10bar, adjustable

Safety valve: 2,4bar

Flow switch: 7,7...13,4L/min (increasing flow rate)

Pressure reducing valve: 1,5...6bar

Heater: 800W

Pump

- power consumption: 70W
- max. flow rate: 60L/min
- max. head: 4m

Measuring ranges

- flow rate: 1...25L/min
- temperature: 0...160°C
- pressure: 2x 0...10bar

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 2010x820x1890mm

Weight: approx. 210kg

Required for operation

compressed air: 3bar

water connection, drain

PC with Windows

Scope of delivery

- 1 trainer
- 1 collecting tank
- 1 set of accessories
- 1 GUNT software CD + USB cable
- 1 manual