

# HL 353.02

## Heat distribution and control in heating systems



### Description

- **setup of a complete domestic heating system together with hot water generator HL 353**
- **two independent heating circuits:**
  - ▶ **heating circuit with one subcircuit**
  - ▶ **heating circuit with two subcircuits**
- **control devices for both heating circuits**

A complete domestic heating system can be set up using the trainer HL 353.02 together with a hot water generator, e.g. HL 353. Hot water passes through the radiators and heats the room air. The temperature is controlled by means of heating controllers.

HL 353.02 contains two heating circuits. Both heating circuits are equipped with commercially available heating technology control devices. Each heating circuit contains a circulating pump.

The simple heating circuit with one subcircuit contains two flat radiators and is controlled by a temperature-led controller. A 3-way mixing valve serves as actuator. A simulator is supplied for varying the outside temperature.

The heating circuit with two subcircuits contains four radiators and two heating controllers. Each subcircuit can be switched on or off by a controller using an electrically switched solenoid valve.

The trainer is supplied with hot water from the supply unit HL 353 and is connected to the feed and return flow connectors using hoses with quick-release couplings.

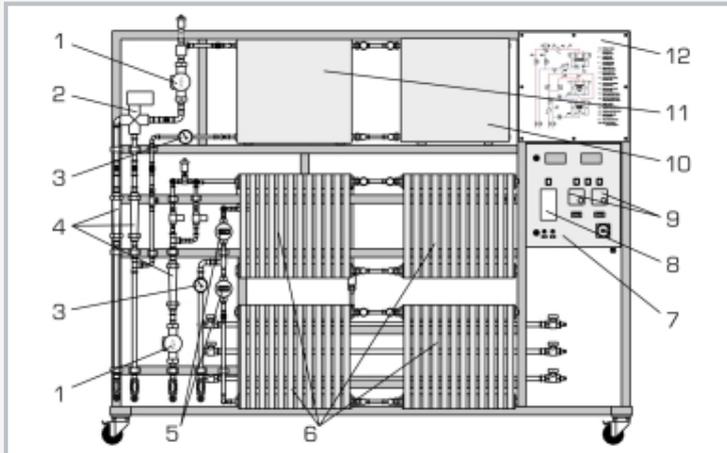
Measured values for temperatures, pressures, differential pressures and flow rates are recorded. For energetic calculations and evaluations, the heating circuit with two subcircuits additionally contains two heat meters.

### Learning objectives/experiments

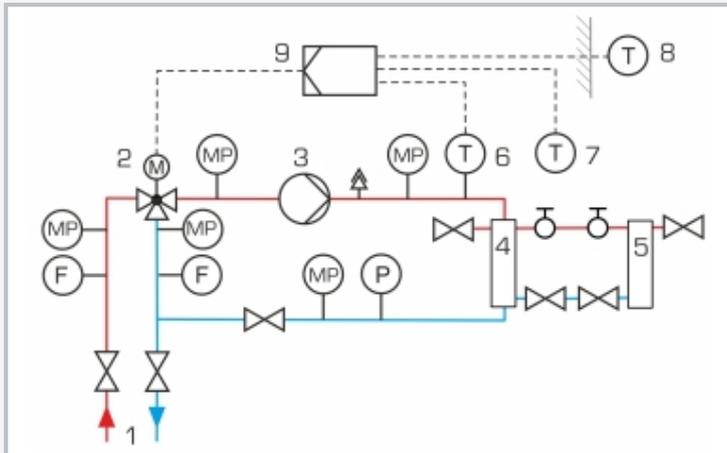
- **design of a room heating system with controller and actuator**
  - ▶ **temperature-led heating controller (outside temperature) with three-way mixing valve**
  - ▶ **simulator for varying outside temperature**
- **function and design of a room heating system divided into sections**
- **hydraulic balancing of heating circuits with multiple radiators**
- **function and design of commercially available heating technology components**
- **measurement of differential pressures, temperatures and flow rates**
- **energy calculation and evaluation of emitted heating capacity based on measured quantity of heat**
- **reading and comprehension of symbols and process schematics**

# HL 353.02

## Heat distribution and control in heating systems

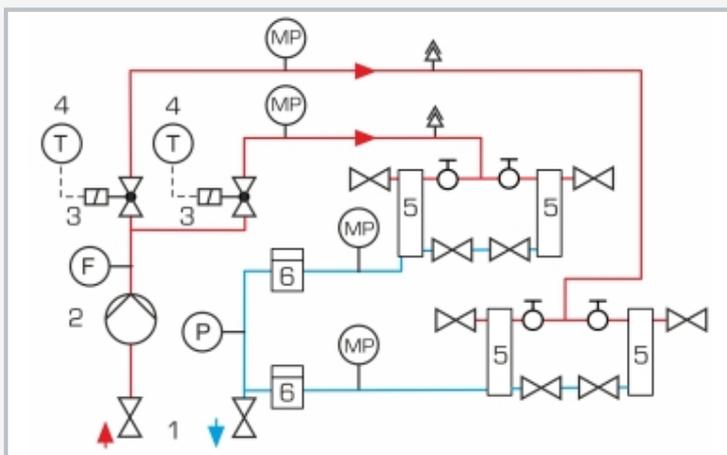


1 circulating pump, 2 three-way-mixing valve, 3 manometer, 4 flow meter, 5 heat meter, 6 radiator, 7 switch cabinet with displays and controls, 8 heating controller (circuit A), 9 heating controller (circuit B), 10 flat radiator (steel), 11 flat radiator (aluminium), 12 process schematic



Heating circuit with one subcircuit

1 connections for supply unit (e.g. HL 353), 2 three-way-mixing valve, 3 circulating pump, 4 flat radiator (aluminium), 5 flat radiator (steel), 6 temperature of the feed flow, 7 room temperature, 8 outdoor temperature, 9 heating controller; MP measuring point for pressure or temperature, F flow, P pressure; red: feed flow, blue: return flow



Heating circuit with two subcircuits

1 connections for supply unit (e.g. HL 353), 2 circulating pump, 3 solenoid valve, 4 room temperature, 5 radiator, 6 heat meter; MP measuring point for pressure or temperature, F flow, P pressure; red: feed flow, blue: return flow

### Specification

- [1] together with hot water generator: setup of a complete domestic heating system with 2 independent heating circuits
- [2] heating circuit with one subcircuit contains 2 flat radiators, circulating pump, heating controller with 3-way mixing valve and simulator for variation of outside temperature
- [3] heating circuit with two subcircuits contains 4 radiators, circulating pump, 2 heating controllers, 2 solenoid valves
- [4] flow control valves for hydronic balancing in heating circuit with two subcircuits
- [5] measurement of flow rate and pressure
- [6] 9 measuring points for differential pressure and temperature (temperature measurement via sensors of HL 353)
- [7] hot water connections with quick-release couplings

### Technical data

1 Flat radiator, aluminium  
 ■ heating capacity: 545W at feed flow 70°C, return flow 55°C and ambient temperature 20°C

1 Flat radiator, steel  
 ■ heating capacity: 665W at feed flow 70°C, return flow 55°C and ambient temperature 20°C

4 Radiators, steel  
 ■ heating capacity: 492W at feed flow 70°C, return flow 55°C and ambient temperature 20°C

2 Circulating pumps  
 ■ max. power consumption: 25/35/45W  
 ■ max. flow rate: 3000L/h  
 ■ max. head: 3,8m

3 Heat meters: 20...90°C, 1,5m<sup>3</sup>/h

Measuring ranges  
 ■ pressure: 2x 0...1,6bar  
 ■ differential pressure: 0...0,25bar  
 ■ flow rate: 3x 40...400L/h

230V, 50Hz, 1 phase  
 LxWxH:2500x760x2100mm  
 Weight: approx. 240kg

### Required for operation

cold and hot water connection, wastewater

### Scope of delivery

- 1 trainer
- 1 set of hoses
- 1 set of tools
- 1 set of instructional material

## **HL 353.02**

### **Heat distribution and control in heating systems**

Required accessories

HL 353                      Hot water generator