HL 300
Hot water heating system

Learning objectives/experiments

- components of a modern heating system and their function
- operating behaviour of a digitally controlled heating circuit with three-way mixing valve
- operating behaviour of a digitally controlled heating circuit with four-way mixing valve
- investigations on a plate heat exchanger in counterflow mode
- investigation of pressure losses at valves and fittings of various designs
- filling of heating systems
- commissioning of a heating system
- hydraulic balancing of radiators
- determination of pump characteristics
- determination of pipe network characteristics
- behaviour of the system with air in the pipe system

Description

- **complete heating system with digital controller**
- **closed water circuit with expansion vessel**

Hot water heating systems transport thermal energy via the heating medium water in order to heat indoor spaces. They are the most common method of heating in residential and office buildings. Such systems consist of four main components: hot water generator, pipework with pumps for transporting the hot water, radiators as heat exchangers and elements for controlling and regulating the temperature.

The HL 300 device forms a complete hot water heating system with two independent heating circuits and a domestic water circuit. One heating circuit is equipped with a three-way mixing valve, the other with a four-way mixing valve.

Both heating circuits have weather-compensated feed flow temperature control system. The heating circuit with three-way mixing valve is equipped with a domestic water priority circuit. The heating circuit with four-way mixing valve simulates operation as a district heating circuit.

The heat provided by an electric heating boiler can be emitted via four radiators, which are selected via valves. A plate heat exchanger is located in the domestic water circuit to allow investigations into the full load behaviour of the heating boiler over a longer period of time. The trainer has a closed water circuit with expansion vessel. The heating system is controlled by a state-of-the-art digital controller.

Important temperatures and pressures are displayed on easy-to-read instruments and are available for further calculations.

The mobile trainer is equipped with 4 lockable castors, of which 2 have brakes. This enables easy manoeuvring and a secure base when stationary. The trainer can be operated from both sides.

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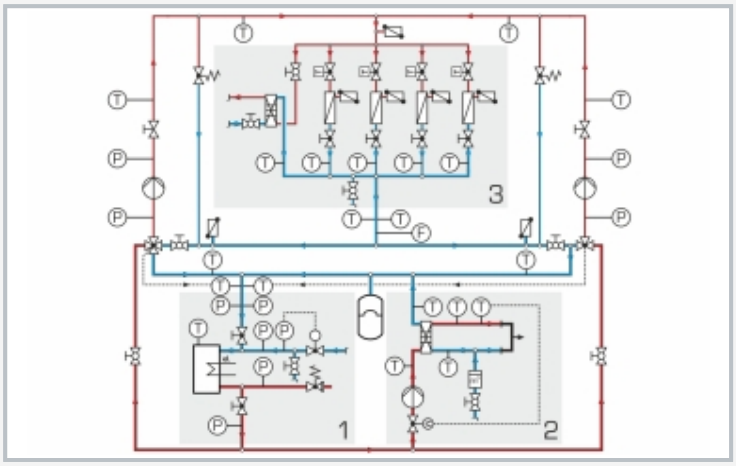
Front: 1 temperature sensor, 2 pump, 3 safety valve, 4 four-way mixing valve with servomotor, 5 domestic water pump, 6 electric heating boiler, 7 expansion vessel, 8 plate heat exchanger, 9 flat radiator, 10 tubular radiator, 11 switch cabinet for operating the heating system, 12 digital heating controller, 13 rotameter, 14 overflow valve, 15 bleeding



Process schematic: 1 heat generator, 2 heating and consumption of domestic water, 3 distribution of heating water; red: feed flow, blue: return flow

Rear: 1 digital heating controller, 2 switch cabinet for operating the heating system, 3 water meter, 4 two-hand mixing valve tap, 5 three-way mixing valve, 6 safety valve

Specification

[1] function and operating behaviour of a heating system with digital heating controller
[2] simulation of operation as a district heating circuit
[3] heating system can be operated from both sides
[4] 4-way mixing valve and 3-way mixing valve
[5] electric heating boiler
[6] 4 different radiators and additional plate heat exchanger as domestic hot water consumer
[7] colour-coded pipes indicate heating feed and return
[8] measurement of temperature, pressure and flow rate

Technical data

Electric heating boiler
- power: 6kW
- max. feed flow temperature: 90°C
- water tank capacity: 16L

Pump, 3-stage
- power consumption: 70W
- max. flow rate: 70L/min
- max. head: 4m

Domestic water pump
- power consumption: 25W
- max. flow rate: 680L/h
- max. head: 1,4m

Plate heat exchanger, 10 plates
- power: 3kW

Water meter: 25m^3/h

Control valve, electric
- travel: 75mm
- response time: max. 45s

Measuring ranges
- temperature: 1x -20...150°C / 4x -50...180°C / 15x 0...120°C
- pressure: 8x 0...2,5bar
- flow rate: 100...1000L/h

400V, 50Hz, 3 phases; 230V, 60Hz, 3 phases
UL/CSA optional
LxWxH: 1800x780x2000mm
Weight: approx. 270kg

Required for operation

water connection

Scope of delivery

1 trainer
1 set of instructional material