

## Closed heating system

At the right is a schematic illustration of the functional differences between a heating system and a water pumping system.

While a water pumping system is an open system with an open outlet (a tapping point such as a faucet), a heating system is a self-enclosed system.

To understand the principle even more easily, consider that all the heating water does is keep moving or circulating in the pipelines.

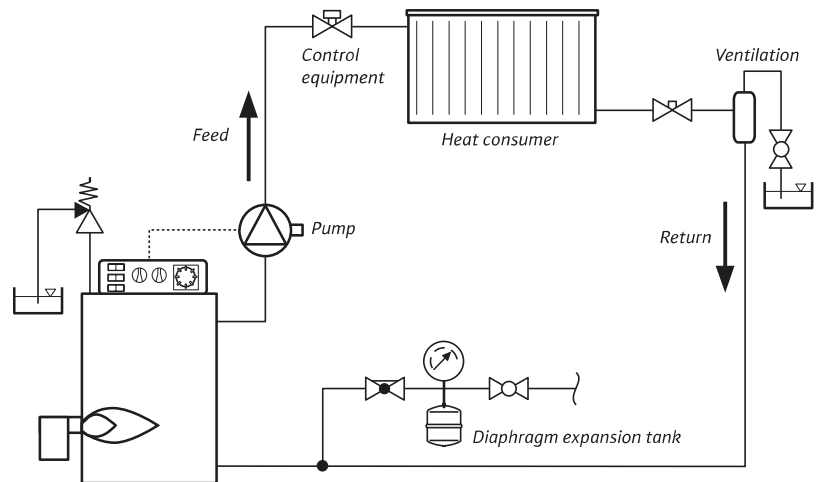
The heating system can be divided into the following components:

- Heat generator
- Heat transport and distribution system
- Diaphragm expansion tank for pressure continuity and pressure control
- Heat consumers
- Control equipment
- Safety valve

Heat generators are defined here as units such as boilers that use gas, oil, or solid fuel, as well as circulating water heaters. They also include electric storage heating systems with central water heating, district heating stations and heat pumps.

The heat transport and distribution system includes all pipelines, distribution and collection stations, and, of course, the circulating pump. The pump output in a heating system is to be designed only to overcome the overall resistance of the system. The building height is not taken into consideration, as the water that the pump forces into the feed line pushes the water in the return line back to the boiler.

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The diaphragm expansion tank is responsible for compensating for the changing water volume in the heating system, depending on the operating temperatures, while simultaneously maintaining pressure continuity.

Heat consumers are the heating surfaces in the rooms to be heated (radiators, convector heaters, panel heaters etc.). Heat energy flows from points at a lower temperature to points at a higher temperature—and the greater the temperature difference, the quicker the flow. This transfer takes place by means of three different physical processes:

- Heat conduction
- Convection
- Radiation.

Today, no technical problem can be solved without a good control system. Thus, it is only natural that control units are a part of every heating system. The most easily understood of these are thermostatic radiator valves for maintaining constant room temperature. Nowadays, there are also highly advanced mechanical, electrical and electronic controls in heating boilers, mixing valves and, of course, in pumps.

*Circulating system using the example of a heating system*

**Note to remember:**  
The building height is not taken into consideration, as the water that the pump forces into the feed line pushes the water in the return line back to the boiler.

Refer to the chapter on "Rough pump design for standard heating systems," page 41