

# HL 320.01

## Heat pump



### Description

- **trainer from the HL 320 modular system**
- **heat pump for operation with different sources**
- **multiple system variants possible in conjunction with other HL 320 modules**

The HL 320 modular system allows experiments on the generation, storage and use of heat from renewable energies. HL 320.01 is one module in this system and includes a heat pump that can be connected to different heat sources and consumers.

The heat pump comprises a compressor, a condenser, an expansion valve and an evaporator. These components are connected to each other via a refrigeration circuit. The refrigerant circulates in the refrigeration circuit powered by the compressor. A source's thermal energy is absorbed at the evaporator. Additional energy is added to the evaporated refrigerant in the compressor. This energy can be output to a consumer as heat.

On the HL 320.01 trainer, the condenser can be incorporated into a heating circuit consisting of various consumers. The evaporator can be connected to a source circuit with different heat sources. The pipes with quick release couplings, circulation pumps and accessories necessary to create these connections are provided.

In practice and depending on the application, different system configurations are often required for optimal efficiency of a heating system. Using HL 320.01 and other HL 320 modules it is possible to systematically investigate the possible variants for incorporating a heat pump into a modern heating system.

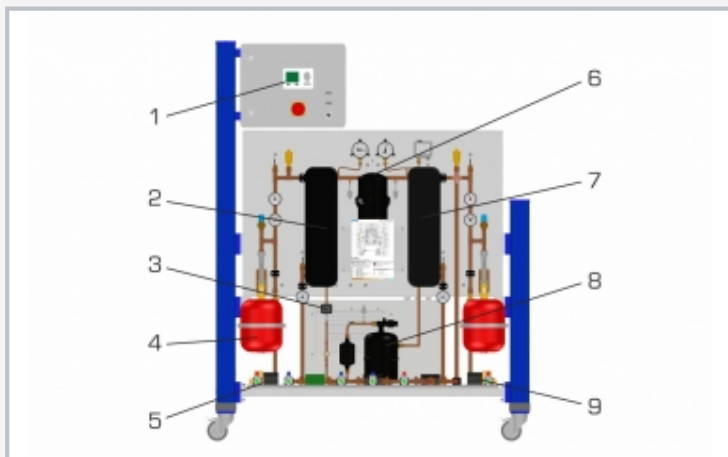
Carefully structured instructional materials have been created for the recommended modular combinations with the HL 320.01 module. As part of the documentation for the HL 320 modular system, these materials set out the basic principles and provide a step-by-step guide through the experiments.

### Learning objectives/experiments

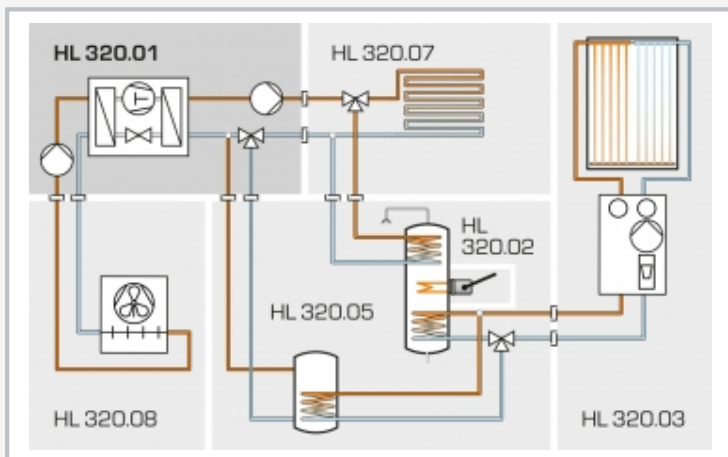
- **familiarisation with heat pump applications for heating rooms and hot water**
- **using the heat pump for cooling**
- **advantages and disadvantages of various system configurations (brine heat pump, air heat pump)**
- **configuring and adjusting a heat pump controller**
- **operating behaviour under varying heat supply and demand**
- **dependence of the coefficient of performance on source and sink temperature**
- **possibilities for optimising the seasonal performance factor**

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## Heat pump



1 controller, 2 evaporator, 3 expansion valve, 4 expansion vessel, 5 pump source circuit, 6 scroll compressor, 7 condenser, 8 receiver, 9 pump heating circuit



Inclusion of HL 320.01 in one possible configuration of the HL 320 modular system

	1	2	3	4	5
HL 320.01			X	X	X
HL 320.02		X			X
HL 320.03	X	X		X	X
HL 320.04	(x)	(x)		(x)	(x)
HL 320.05	X	X		X	X
HL 320.07		X	X	X	X
HL 320.08			X	X	X

Recommended combinations of the HL 320 modular system

### Specification

- [1] Heat pump for the HL 320 modular system
- [2] Connections for various heat sources and sinks
- [3] One circulation pump and one safety module each with expansion vessel for heating and source circuit
- [4] Sensors for temperature, flow rate and pressure with connection to the controller
- [5] Controller with data logger and LAN connection for acquisition of measurement data and for controlling the system
- [6] Software for transferring, displaying and evaluating the controller's measured data

### Technical data

#### Heat pump

- heating capacity: approx. 2,3 kW at 5/65°C

#### Heating and source circuit pumps

- max. flow rate: 3m<sup>3</sup>/h
- max. head: 4m

#### Universal controller

- inputs: up to 16
- outputs: up to 16
- interfaces: DL bus, CAN, LAN

#### Measuring ranges

- temperature:
  - ▶ 4x -50...180°C
  - ▶ 3x 0...120°C
  - ▶ 1x -20...60°C
- flow rate: 2x 0,02...1,5m<sup>3</sup>/h
- pressure:
  - ▶ 1x -1...15bar
  - ▶ 1x -1...49bar
  - ▶ 2x 0...6bar
  - ▶ 2x 0...50bar
  - ▶ 1x 0...18bar
  - ▶ 2x 0...10bar

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

LxWxH: 1500x800x1700mm

Weight: approx. 125kg

### Required for operation

PC with Windows

### Scope of delivery

- 1 trainer
- 1 manual

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### Required accessories

#### Combination 3

065.32007	HL 320.07	Underfloor heating / geothermal energy absorber
065.32008	HL 320.08	Fan heater / air heat exchanger

#### Combination 4

065.32003	HL 320.03	Flat plate collector
065.32005	HL 320.05	Central storage module with controller
065.32007	HL 320.07	Underfloor heating / geothermal energy absorber
065.32008	HL 320.08	Fan heater / air heat exchanger

#### Combination 5

065.32002	HL 320.02	Conventional heating
065.32003	HL 320.03	Flat plate collector
065.32005	HL 320.05	Central storage module with controller
065.32007	HL 320.07	Underfloor heating / geothermal energy absorber
065.32008	HL 320.08	Fan heater / air heat exchanger

### Optional accessories

#### Combination 4, 5

065.31301	HL 313.01	Artificial light source
065.32004	HL 320.04	Evacuated tube collector