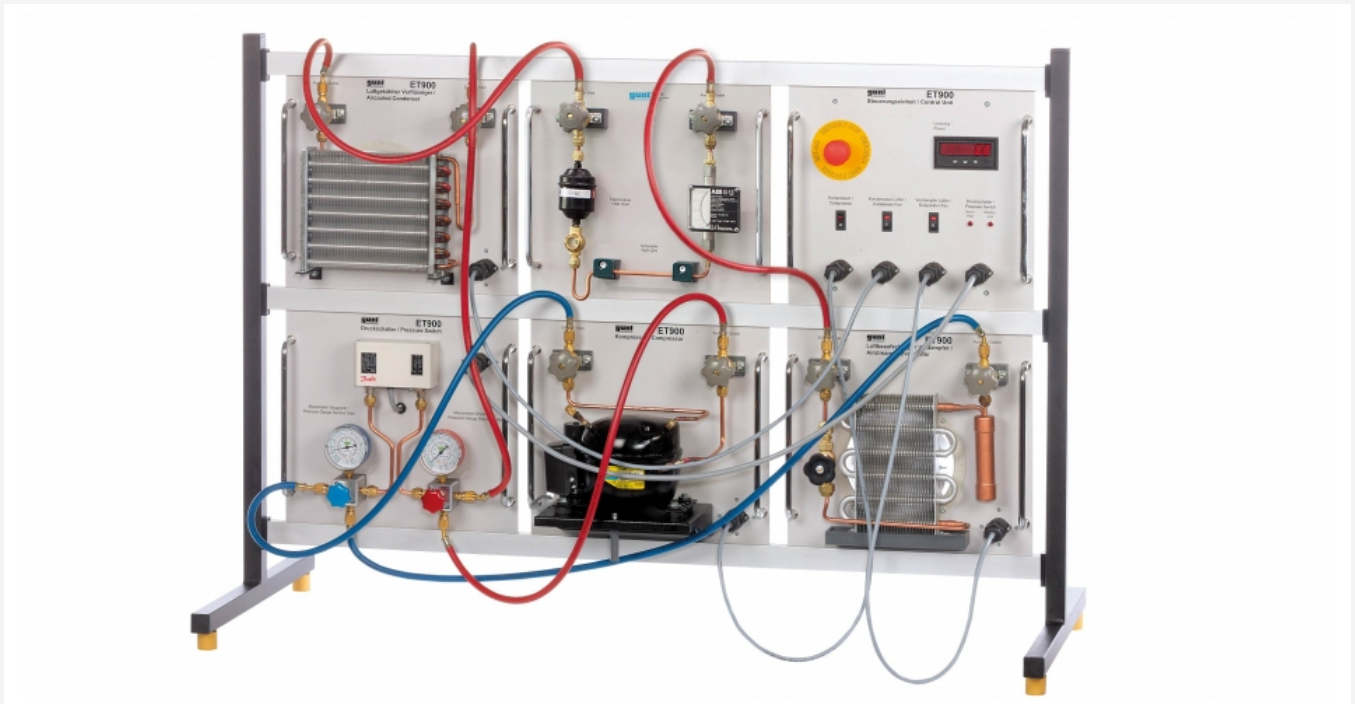


# ET 900

## Introduction to refrigeration



### Description

- training system with interchangeable modules
- components mounted on plates
- rapid connection via hoses

With simple and clear experiments this equipment is intended mainly as a basic introduction to refrigeration.

ET 900 enables familiarisation with the operation and handling of a refrigeration system. The experimental unit includes all the necessary components for a fully operational refrigeration circuit, such as compressor, condenser, evaporator and a needle valve as expansion element. Other components complement the scope of the equipment: display and control panel, receiver, pressure switches and pressure display to protect the compressor against excessive pressure and a flow meter and sight glass with filter/drier. A heat exchanger air-refrigerant is available as condenser. The evaporator is present twice: as air/refrigerant heat exchanger and as water/refrigerant heat exchanger. This allows for different component combinations.

The components are mounted on plates and form installation-ready modules. 6 modules are positioned in the frame at any one time and connected via hoses and supply cables. The receiver is integrated into the refrigeration circuit as a stand-alone module. This allows for the construction of different simple compression refrigeration systems. For operating the system the refrigerant filling and evacuation equipment is required, e.g. ET 150.01.

In experiments the processes in the equipment and the changes in the refrigerant state are initially demonstrated. Continued experiments allow the use of the equipment as a refrigeration system. Pressures, flow rates power consumption of the compressor are displayed as important characteristic variables of refrigeration circuits. The temperature is measured by interlaboratory thermometers.

### Learning objectives/experiments

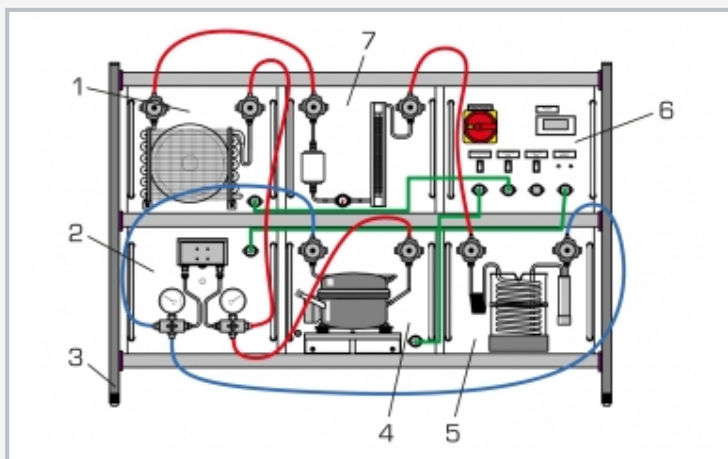
- fundamentals of a simple refrigeration circuit
  - ▶ detection and understanding of the cyclic process
  - ▶ changes of state of the refrigerant
  - ▶ representation the refrigeration circuit in the process schematic
  - ▶ representation of the cyclic process in the log p-h diagram
  - ▶ estimating key figures, refrigeration capacity and heat fluxes
- different operating modes
  - ▶ air cooling
  - ▶ generating cold water
- practical exercises
  - ▶ draining and filling the refrigeration system (with ET 150.01)
  - ▶ fault finding

# ET 900

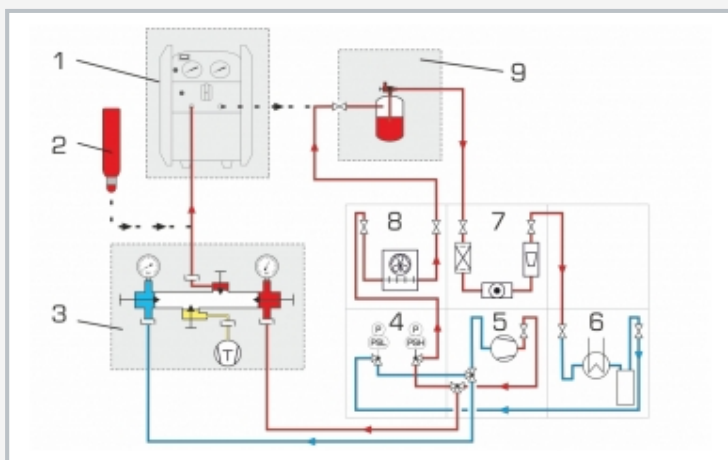
## Introduction to refrigeration



1 air cooling evaporator, 2 water cooling evaporator, 3 sight glass with filter/drier and flow meter, 4 receiver, 5 pressure switch, 6 air-cooled condenser, 7 compressor, 8 display and control panel



Refrigeration circuit with air-cooled condenser and water cooling evaporator; 1 condenser, 2 pressure switch, 3 frame, 4 compressor, 5 evaporator, 6 displays and controls, 7 sight glass with filter/drier and flow meter; blue: refrigeration low pressure, red: refrigeration high pressure green: power supply cables



1 refrigerant recycling station recommended for operation (not included), 2 refrigerant, 3 refrigerant filling and evacuation equipment for operation required, e.g. ET 150.01, 4 pressure switch, 5 compressor, 6 condenser, 7 sight glass with filter/drier and flow meter, 8 evaporator, 9 receiver; yellow: vacuum, blue: refrigeration low pressure, red: refrigeration high pressure

### Specification

- [1] setup of simple refrigeration circuits with different components
- [2] 8 self-contained operational modules
- [3] light-weight aluminium frame to arrange 6 modules
- [4] evaporator available as air/refrigerant heat exchanger (finned tube heat exchanger)
- [5] condenser available as air/refrigerant heat exchanger (finned tube heat exchanger) and as water/refrigerant heat exchanger (with pipe coil)
- [6] modules fitted with manual valves
- [7] components connected via hoses
- [8] refrigerant R513A, GWP: 631

### Technical data

- Hermetic refrigerant compressor
- power consumption: 67W at 5/40°C
  - refrigeration capacity: 152W at 5/40°C

Water tank, evaporator: 2L

Pressure switch activation pressure

- LP: 1bar
- HP: 14bar

Manometer

- inlet side (low pressure): 1...10bar
- outlet side (high pressure): 1...30bar

Rotameter: 0...7,4L/h

Refrigerant

- R513A
- GWP: 631
- filling volume: 750g
- CO<sub>2</sub>-equivalent: 0,5t

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1300x700x900mm

WxH: 370x340mm (modules for frame installation)

LxWxH: 300x150x300mm (receiver)

Weight: approx. 30kg

### Required for operation

filling and evacuation equipment is required, e.g. ET 150.01  
refrigerant recycling station recommended

### Scope of delivery

- 1 frame
- 8 modules
- 1 set of hoses
- 1 set of cables
- 1 set of instructional material

# ET 900

## Introduction to refrigeration

### Optional accessories

061.15001	ET 150.01	Refrigerant filling and evacuation equipment
061.15002	ET 150.02	Tool set
020.30009	WP 300.09	Laboratory trolley