

# ET 182

## Secondary controllers in refrigeration systems



### Description

- familiarisation with common secondary controllers in refrigeration systems
- secondary controllers can be de-commissioned individually for fault finding
- refrigeration and freezing stage with cooling load
- different secondary controllers at the water-cooled condenser

So-called secondary controllers are used to ensure the optimum operation of large, complex refrigeration systems. They control the evaporation pressure (KVP), the intake pressure of the compressor (KVL), the delivery capacity of the compressor (KVC), the condensation pressure (WVFX, KVR) and the receiver pressure (KVD, NRD).

With this trainer the student can try out the operation of the different secondary controllers. The secondary controllers can be disabled as required by bypassing or blocking. This option can be used for fault finding. By adjusting the secondary controllers the effect on the overall system can be studied.

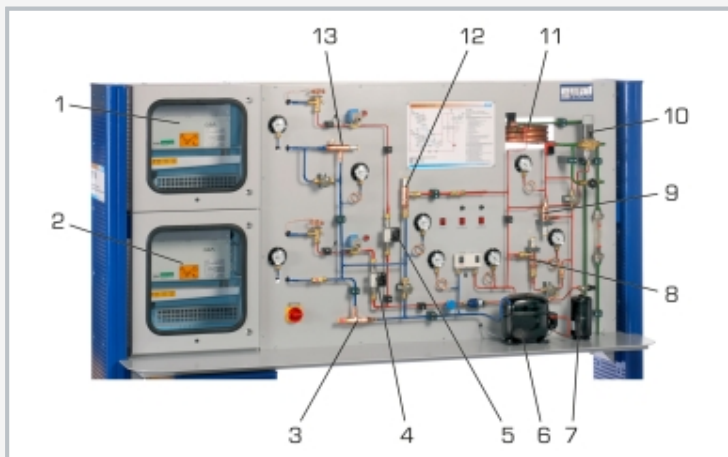
Manometers at all important locations and a manual thermometer enable the monitoring of the system state. The two evaporators for the cooling and freezing stage can be selected via solenoid valves. With an adjustable electrical heater in the refrigeration chamber the effect of a changing cooling load on the secondary controllers can be examined.

### Learning objectives/experiments

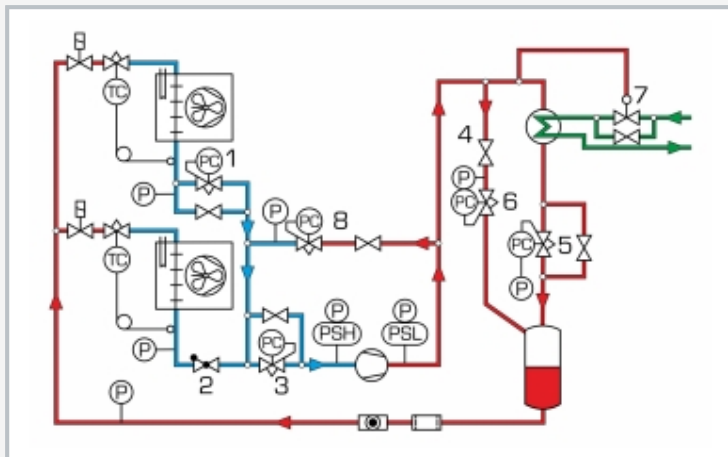
- properties and application options of different secondary controllers
  - ▶ evaporation pressure controller (KVP)
  - ▶ start-up controller (compressor intake control; KVL)
  - ▶ capacity controller (control of the compressor delivery capacity; KVC)
  - ▶ condensation pressure controller (WVFX, KVR)
  - ▶ receiver pressure controller (KVD with NRD)
- adjustment of optimum operating points
- fault finding in secondary controllers

# ET 182

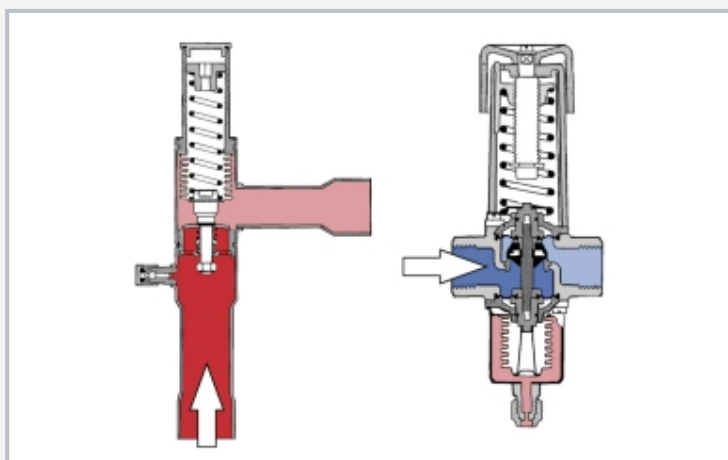
## Secondary controllers in refrigeration systems



1 refrigeration chamber, 2 freezing chamber, 3 start-up controller, 4+5 flow meter, 6 compressor, 7 receiver, 8 receiver pressure controller, 9 condensation pressure controller, 10 pressure-controlled water valve, 11 water-cooled condenser, 12 capacity controller, 13 evaporation pressure controller



1 evaporation pressure controller KVP, 2 non-return valve NRV, 3 start-up controller KVL, 4 non-return valve, 5 condensation pressure controller KVR, 6 receiver pressure controller KVD, 7 pressure-controlled water valve WVFX, 8 capacity controller KVC; blue: low pressure, red: high pressure, green: cooling water



Condensation pressure control: condensation pressure controller KVR (left) and pressure-controlled water valve WVFX (right)

### Specification

- [1] trainer from the GUNT practical series for the training of mechatronics engineers for refrigeration
- [2] refrigeration system with different secondary controllers: evaporation pressure controller KVP, capacity controller KVC, condensation pressure controller KVR, pressure-controlled water valve WVFX as condensation pressure controller, receiver pressure controller KVD, start-up controller KVL
- [3] 2 refrigeration chambers: refrigeration and freezing stage
- [4] evaporator selectable via solenoid valves
- [5] adjustable electric heater in the refrigeration chambers as cooling load
- [6] water-cooled coaxial condenser
- [7] pressure measurement at all relevant points in the system
- [8] refrigerant R513A, GWP: 631

### Technical data

#### Compressor

- refrigeration capacity: 990W at 5/40°C
- power consumption: 685W at 5/40°C

Cooling load: 0...500W

Receiver: 1,3L

#### Refrigerant

- R513A
- GWP: 631
- filling volume: 1,4kg
- CO<sub>2</sub>-equivalent: 0,9t

#### Measuring ranges

- pressure: 5x -1...9bar / 3x -1...24bar
- flow rate:
  - ▶ 20...250L/h (water)
  - ▶ 1...11,5L/h, 2...27L/h (refrigerant)
- temperature: -50...300°C

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 2500x790x1900mm

Weight: approx. 280kg

### Required for operation

water connection, drain

### Scope of delivery

- 1 trainer
- 1 set of accessories
- 1 set of instructional material