ET 915.02

Model of a refrigeration system with refrigeration and freezing stage

Description

- **series and parallel connection of evaporators**
- **component operation and fault simulation via the GUNT software**

ET 915.02 is part of the HSI training system for refrigeration and air conditioning technology. In combination with the base unit ET 915 the operational model of a refrigeration system with refrigeration and freezing stage results. The model is plugged onto the base unit, secured using fasteners and connected with refrigerant hoses to become a complete refrigeration circuit.

In refrigeration and freezing combinations evaporators are preferably connected in parallel. To increase the refrigeration capacity, evaporators are operated connected in series. Here different pressure levels in the evaporators can be used to obtain different temperature ranges for refrigeration or freezing.

ET 915.02 includes two separate refrigeration chambers with evaporator and expansion elements. The evaporators can be optionally operated connected in series or in parallel. Two fans in the refrigeration chambers support the achievement of an even temperature distribution. With heaters cooling loads can additionally be simulated.

One of the refrigeration chambers can optionally be operated with an expansion valve or a capillary tube as expansion element. The various operation modes are set via solenoid valves. An evaporation pressure controller permits in parallel operation the independent adjustment of the temperature level in the upper chamber. All components are clearly arranged on a panel.

The operation of individual system components, here temperature control, fan, heater, compressor and solenoid valves, takes place via the software.

The software offers the option to simulate faults. Temperatures and pressures in the system are recorded by sensors and displayed dynamically in the software. The effect of parameter changes can be tracked online in the log p-h diagram.

Fundamentals and individual components are represented in the educational software for ET 915.02. Performance assessments check the learning progress. With the aid of the authoring system further exercises and performance assessments can be created.

Learning objectives/experiments

- design and operation of a refrigeration system with two evaporators
- series and parallel connection of two evaporators
- familiarisation with the different expansion elements
  - operation with capillary tube
  - operation with expansion valve
- operating behaviour under load
- refrigeration cycle in the log p-h diagram
- effect of the evaporation pressure
- fault simulation

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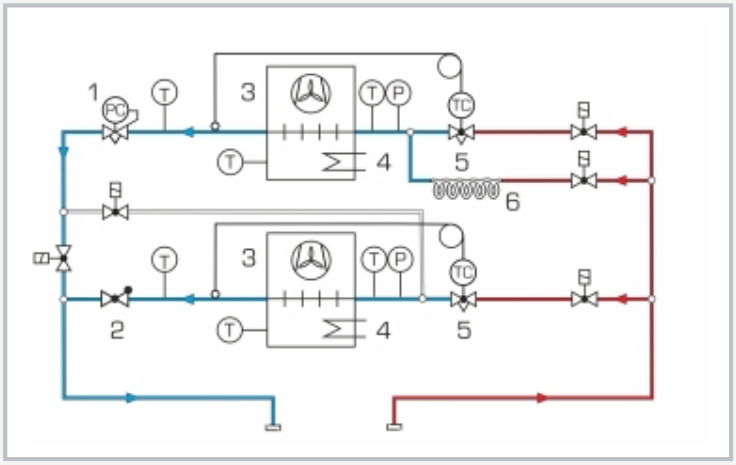
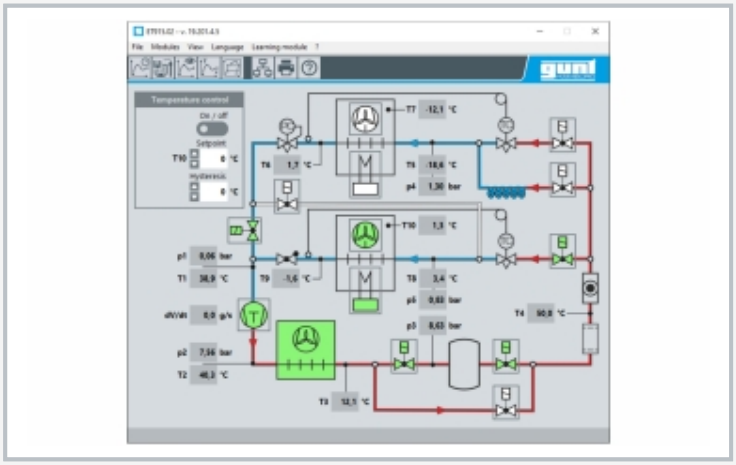
1 evaporation pressure controller, 2 evaporator, 3 fan, 4 heater, 5 connections to ET 915, 6 process schematic, 7 capillary tube, 8 solenoid valve, 9 expansion valve



Refrigeration system model, evaporators connected in parallel:
1 evaporation pressure controller, 2 non-return valve, 3 evaporator, 4 heater, 5 expansion valve, 6 capillary tube; T temperature, P pressure; blue: low pressure, red: high pressure



Software screenshot: process schematic

Specification

[1] model of a refrigeration system to plug onto the base unit ET 915
[2] GUNT training system with HSI technology
[3] each refrigeration chamber includes: evaporator with fan (to recirculate the air) and heater to generate the cooling load
[4] refrigeration chambers with transparent front
[5] adjustable evaporation pressure controller
[6] selectable expansion elements: expansion valve or capillary tube
[7] operating modes of the system configurable via 5 solenoid valves
[8] sensors to record temperature and pressure
[9] operation of solenoid valves, fan, heater and fault simulation via software
[10] GUNT software with control functions and data acquisition via USB under Windows 11
[11] GUNT software: educational software, data acquisition, system operation

Technical data

Refrigeration chamber
- LxWxH: 270x270x220mm

Electric PTC heater as cooling load: 210W

Capillary tube: length 2m

Evaporation pressure controller: 0...5,5bar

Measuring ranges
- temperature: 6x ±50°C
- pressure: 2x -1...9bar

LxWxH: 850x400x750mm
Weight: approx. 45kg

Scope of delivery

1 refrigeration system model, filled with refrigerant
1 GUNT software + USB cable

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Required accessories

ET 915	HSI training system refrigeration and air conditioning technology, base unit

Optional accessories

for Remote Learning

GU 100	Web Access Box
with	
ET 91502W	Web Access Software