ET 930
Evaporator control with electronic expansion valve

Description

- **practical programming of a modern refrigeration controller**
- **software to simulate a commercial freezer**
- **real components of evaporator control fitted to front panel for demonstration purposes**

The control of refrigeration units such as chiller cabinets, refrigerated display cases and freezers is a key topic in commercial refrigeration. The control aims at safeguarding a high level of food quality with simultaneous energy-efficient operation.

With ET 930 the operation and programming of an industrial evaporator controller (refrigeration controller) is taught in the example of a freezer. Software simulates the freezer. The schematic depicted on the front panel aids comprehension. Lamps in the schematic indicate the operating state of the individual components.

The refrigeration controller controls the temperature of the freezer via the electronic expansion valve. It also controls the air circulation fan.

It provides for the defrosting of the evaporator and prevents the freezing of the freezer lid by way of a frame heating. The refrigeration controller continuously monitors the operation of the components and issues an alarm signal should errors occur.

The controller is programmed via a data cable using a programming device. This allows for adjustments of the thermostat function, daytime/night-time operation, the defrosting function, energy saving functions and safety functions.

In the simulation software the outside temperature is entered, the refrigerant selected and the door of the freezer opened or closed. In the "time graph" menu, the operating states of the individual components are displayed and the temperature and pressure graphs recorded.

Additional real components, such as expansion valve and pressure and temperature sensors, are used for demonstration purposes and increase the practical relevance.

Learning objectives/experiments

- modern refrigeration controller with electronic expansion valve
- functional principle of the controller
  - thermostat function
  - daytime and night-time operation
  - operation with open and closed freezer
  - defrost functions
  - safety functions
  - alarm functions
  - monitoring of the components
- controller programming
- fault finding

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1 pressure sensor, 2 electronic expansion valve, 3 display of the refrigeration controller, 4 temperature sensor, 5 diagram of the simulated freezer
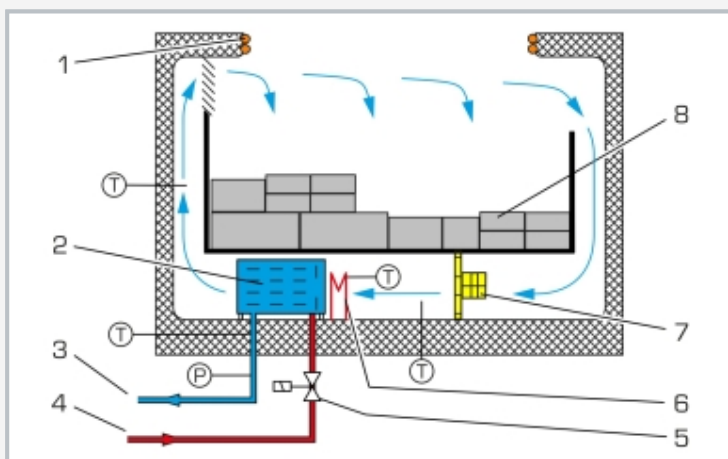
Simulated freezer: 1 heating at the frame, 2 evaporator, 3 intake side condensing unit connection, 4 delivery side condensing unit connection, 5 expansion valve, 6 electric defrost heater, 7 fan, 8 refrigerated goods; T temperature, P pressure
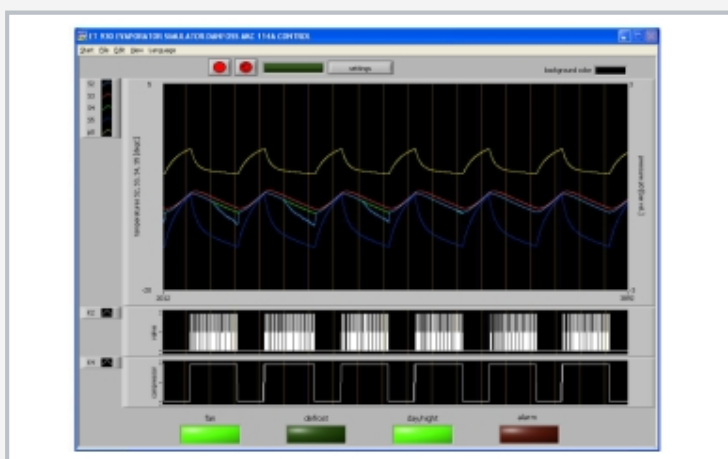
Screenshot of the simulation software: temperature graphs (top), switching states (bottom)

Specification

[1] experimental unit from the GUNT practical series for the training of mechatronics engineers for refrigeration

[2] investigation and programming of an industrial refrigeration controller in the example of a freezer

[3] simulation of the freezer by way of software

[4] schematic on the front panel with lamps to indicate the operating states of the actuators

[5] programming of the refrigeration controller using a programming device

[6] simulated freezer with compressor, electronic expansion valve, fan, electric defrost heater for the evaporator, frame heating, pressure and temperature sensors

[7] real freezer components for demonstration purposes: 1 electronic expansion valve, 1 pressure sensor, 2 temperature sensor

[8] GUNT software for data acquisition via USB under Windows 10

Technical data

Functions of the refrigeration controller
- thermostat function
- daytime/night-time operation
- defrost functions
- messages and alarms
- fan operation
- energy saving functions
- safety functions

Simulated sensors
- air temperature upstream of the evaporator
- air temperature downstream of the evaporator
- evaporator surface temperature
- refrigerant temperature upstream of the compressor
- refrigerant pressure upstream of the compressor

Functions of the simulation software
- outer temperature input
- opening/closing the door
- selection of refrigerant
- pressure and temperature time graphs

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 660x350x570mm
Weight: approx. 30kg

Required for operation

PC with Windows

Scope of delivery

1   experimental unit
1   GUNT software + USB cable
1   set of instructional material

G.U.N.T. Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Telefon (040) 67 08 54-0, Fax (040) 67 08 54-42, Email sales@gunt.de, Web www.gunt.de
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Optional accessories

WP 300.09   Laboratory trolley