ET 170

Electrical faults in simple air conditioning systems

Description

- **simulation of a simple air conditioning system with compressor, fan and thermostat**
- **investigation of key electrical components from air conditioning technology**
- **simulation of 15 faults**

Identifying electrical faults in air conditioning systems requires comprehensive knowledge This knowledge includes the design and operation of the individual electrical components as well as the reading of circuit diagrams. ET 170 helps to acquire this knowledge.

ET 170 demonstrates the electrical circuit of a simple air conditioning system, consisting mainly of a refrigerant compressor and fan at the air cooler. The control circuits are actually present. Compressor and fan motor are simulated.

The compressor is controlled via a thermostat. Via a ballast the fan motor speed can be switched in two stages. The start of the compressor motor takes place via a start-up relay and start-up capacitor.

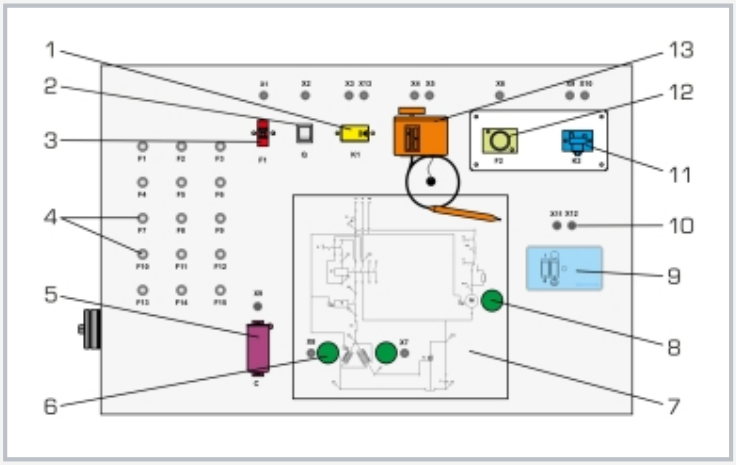
Typical protection devices, such as circuit breaker, complete the electrical circuit. The operating state of the simulated components compressor and fan is indicated via lamps in the circuit diagram on the front panel.

The simulation of 15 different faults, such as coil fracture in the motor or faulty switching contact, is possible. For fault indication, voltages and resistances are checked at the lab jacks with the multimeter. The depiction of the circuit diagram on the front panel facilitates the allocation of the measuring points.

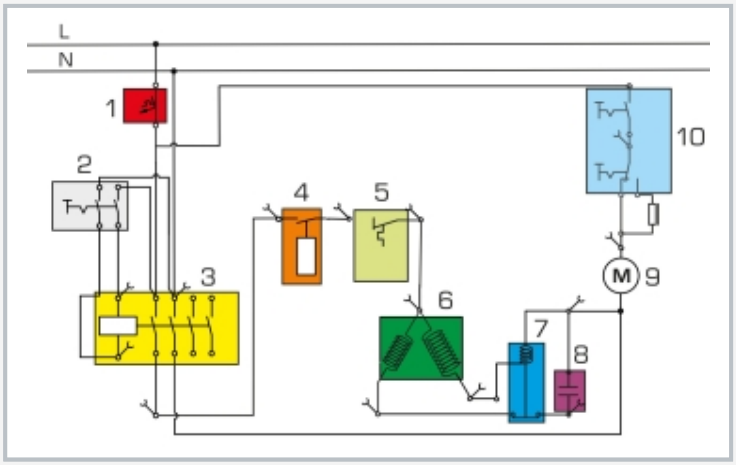
Learning objectives/experiments

- electrical design and principle of operation of simple air conditioning systems
- read and understand electrical circuit diagrams
- design and operation of electrical components in an air conditioning system
  - start-up capacitor
  - start-up relay
  - overheat protection
  - main contactor
  - automatic fuse
  - on/off switch
  - speed switch
  - thermostat
- fault finding in electrical components
  - in idle state
  - under mains voltage

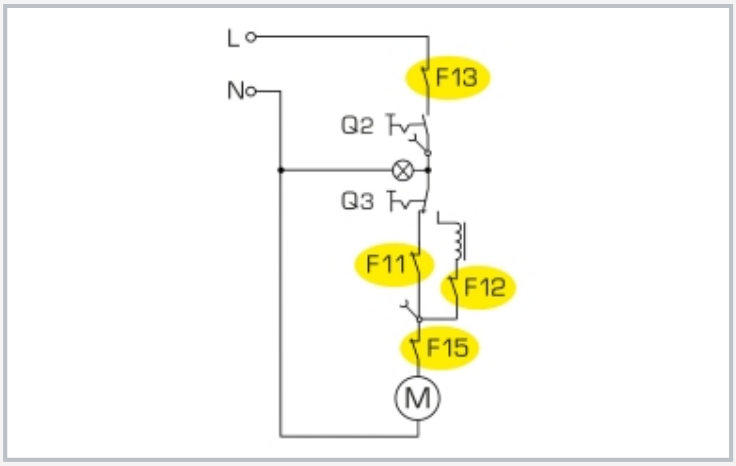
ET 170
Electrical faults in simple air conditioning systems



1 main contactor, 2 main switch, 3 automatic fuse, 4 buttons for faults, 5 start-up capacitor, 6 lamp for simulated compressor, 7 circuit diagram, 8 lamp for simulated fan, 9 fan switch, 10 lab jacks, 11 start-up relay, 12 overheat protection, 13 thermostat



1 automatic fuse, 2 main switch, 3 main contactor, 4 thermostat, 5 overheat protection, 6 simulated compressor, 7 start-up relay, 8 start-up capacitor, 9 simulated fan, 10 fan switch



Faults in the fan: F11 high speed faulty, F12 low speed faulty, F13 no power supply, F15 fan motor faulty

Specification

[1] experimental unit from the GUNT practical series for the training of mechatronics engineers for refrigeration
[2] simulation of the electrical circuit of a simple air conditioning system for cooling
[3] real control circuits with electrical components, simulated load circuits
[4] electrical simulation of compressor and fan
[5] temperature control with thermostat and compressor
[6] fan with 2 adjustable speeds
[7] operating states of the simulated components indicated via lamps in the circuit diagram
[8] circuit diagram depicted on the front panel
[9] identification of 15 faults: multimeter measures voltages or resistances at the lab jacks

Technical data

Simulated compressor
- start-up current: >3A

Electrical components for the compressor
- start-up capacitor
- start-up relay
- overheat protection (bimetallic)

Electrical components for the fan
- on/off switch
- speed switch

Thermostat: -5...35°C

General safety devices
- main contactor
- automatic fuse

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 900x400x650mm
Weight: approx. 30kg

Scope of delivery

1 experimental unit
1 multimeter
1 set of instructional material

ET 170

Electrical faults in simple air conditioning systems

Optional accessories

WP 300.09	Laboratory trolley