

CONDITIONING AND REFRIGERATION

T108/3D - Air Conditioning Study Unit with Heat Pump Simulation - Code 953843



1. Generality

The T108/3D is an extremely easy-to use and functional unit designed to allow the understanding of the theoretical principles governing the frigorific cycles and their problems. The unit allows the study of the frigorific cycle and its analysis on the $\log(p)$ vs h diagram, the study of industrial components behavior and allows also to simulate an heat pump.

A front panel with mimic diagram and instrumentation allows to keep the most significant thermodynamic quantities under control, so facilitating the students' understanding and the teacher's task.

The unit is supplied with manuals which describe the components, the installation and utilization procedures as well as many exercises with experimental results.

2. Composition

The unit includes:

- hermetic compressor, 370 W
- air/R134a evaporator
- motor fan
- water/R134a condenser
- thermostatic isenthalpic valve
- cooling fluid sight glass
- dehydrator filter

- flow meter with control valve of the H₂O delivery at the condenser
- pressure gauge for condensation pressure
- pressure gauge for evaporation pressure
- maximum pressure switch
- N. 2 temperature digital indicators
- N. 2 temperature selectors
- N. 8 temperature probes type Pt100
- N. 1 energy counter
- magnetothermic differential switch, manual controls, signaling lamps and protection fuses

3. Description

The main characteristic of the unit is to allow the study of the heat pump frigorific cycles.

While running, the heat is taken off from the environment air, lowering its temperature and humidity (summer conditioning), and it is yielded to the water, which warms up.

An hermetic alternative compressor makes the compression work. The evaporator air/R134a includes a set of copper tubes with aluminum fins, through which the cooling liquid R134a flows; the air is pumped across the tubes with a motor fan. The condenser water/R134a is a concentric tubes type and the cooling fluid is water. A thermostatic valve allows the gas isenthalpic expansion.

The instrumentation is inserted into the actual cycle and allows to constantly check all the main parameters: two digital instantaneous thermometers with switches visualize one the inlet temperatures and the other the outlet temperatures, one flow meter visualizes the condensation water flow rates and two pressure gauges visualize the condensation and evaporation pressures. The instrumentation comes with a complete synoptic panel allowing the immediate understanding of the frigorific cycle.

4. Technical specifications

- Compressor power 370W
- Condenser capacity 817 Kcal/h per $\Delta T=10^{\circ}\text{C}$
- Evaporator capacity 602 Kcal/h per $\Delta T=10^{\circ}\text{C}$
- Water consumption 80l/h approx

5. Experiment

- Thermodynamic study of the cooling cycle on log(P) vs h diagram
- Real efficiency measurement (COP)
- Condenser thermal balance.
- Evaporator thermal balance
- Unit performances evaluation when the condenser water flow rate changes
- Theoric study on the benefit and the efficiency of the heat pump

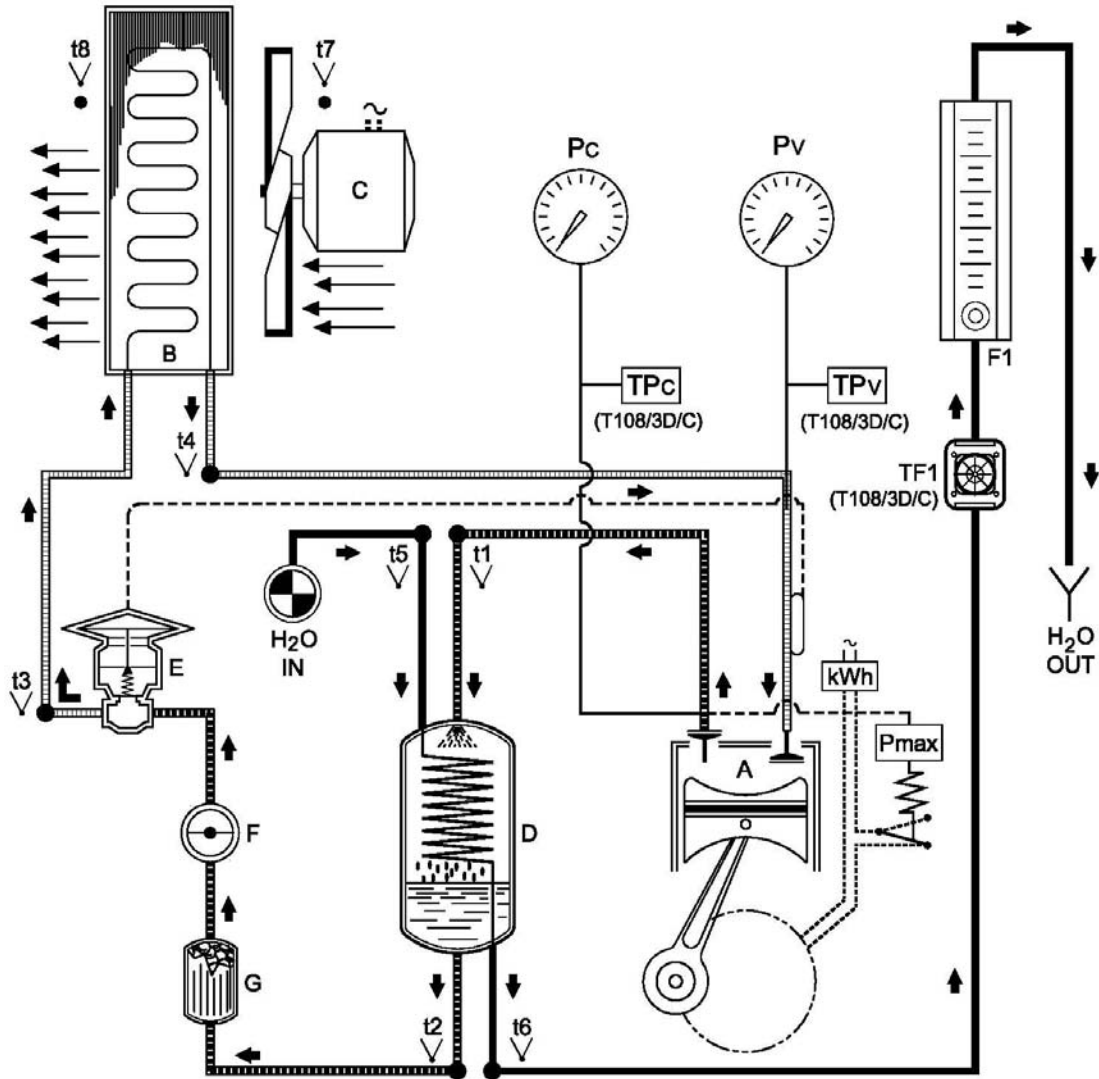
6. Required services

- Electric supply: 220V single-phase, 50/60 Hz
- Water supply: net water, maximum pressure 3 bar

7. Weight and Dimensions

- Dimensions : 600x600x1350 h mm
- Weight: 100 kg

8.Synoptic



Keys:

- A. hermetic compressor
- B. air/R134a evaporator
- C. motor fan
- D. water/R134a condenser
- E. thermostatic isenthalpic valve
- F. cooling fluid sight glass
- G. dehydrator filter
- t1. temperature sensor: condenser coolant inlet
- t2. temperature sensor: condenser coolant outlet
- t3. temperature sensor: evaporator coolant inlet
- t4. temperature sensor: evaporator coolant outlet
- t5. temperature sensor: condenser water inlet
- t6. temperature sensor: condenser water outlet
- t7. temperature sensor: evaporator air inlet
- t8. temperature sensor: evaporator air outlet
- F1. flowmeter with control valve of the condenser H₂O flow rate
- TF1. flow transducer for the condenser H₂O flow rate (on T108/3D/C only)
- Pc. pressure gauge for condensation pressure
- TPc. pressure transducer for condensation pressure (on T108/3D/C only)
- Pv. pressure gauge for condensation pressure
- TPv. pressure transducer for evaporation pressure (on T108/3D/C only)
- Pmax. maximum pressure switch
- KWh. electric energy counter

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