

CONDITIONING AND REFRIGERATION

T108/4D/C - Computerized Low Temperature Refrigeration Study Unit - Code 953814



1. General

The T108/4D/C is an extremely easy-to use and functional unit able to permit the study of a low temperature refrigerating cycle (down to 250K, -20°C approximately) through a simple compression refrigerating cycle. The unit allows the study of this cycle and particularly the influence of the temperature of the body to be cooled. Moreover it is possible to evaluate the cycle performances, hence the heat exchange when the body temperature changes.

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. Moreover, the transducers and the dedicated software allows the data acquisition of the main thermodynamic quantities and to obtain or as a table or as a graph, the acquired values and the thermodynamic calculated quantities.

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

2. Composition

The unit includes:

- hermetic compressor unit
- stainless steel calorimeter
- calorimeter level gauge
- adjustable resistance (0÷2000W)
- electrical stirrer

- R104/ethylene glycol coil evaporator
- forced air condenser
- thermostatic isenthalpic expansion valve
- suction pressure regulation valve
- dehydrating filter
- pressure gauge for condensation pressure
- pressure gauge for evaporation pressure
- maximum pressure switch
- maximum temperature switch
- cooling fluid sight glass
- N. 2 temperature digital indicators
- N. 2 temperature selectors
- N. 7 temperature probes type Pt100
- N. 7 temperature signal transducers with analog outlet for PC data acquisition
- N. 1 resistance power digital indicator
- N. 1 energy meter
- N. 1 chronometer
- N. 2 pressure signal transducers with analog outlet for PC data acquisition
- N. 1 A/D conversion card with USB interface
- magnetothermic differential switch, manual controls, signaling lamps and protection fuses.
- data acquisition and analysis software

3. Description

The main characteristic of the unit is that to enable the student to study the low temperature refrigerating cycles, hence the properties of the low temperature heat exchanges, particularly the non stationary low temperature heat exchange, as a function of the temperature of the body to be cooled.

An hermetic compressor provides the compression work. The unit includes a stainless steel calorimeter, containing a solution of water and ethylene glycol. The solution is the mass to be cooled and it can be heated through an adjustable resistance at different temperature. The evaporator is a copper coil inserted in the calorimeter; the cooling fluid is R404, because of the needed low temperature. The condenser is a forced air type and the condensing fluid is air, forced through a fan directed tangentially to a series copper coils in which the R404 flows.

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 and the calorimeter temperature 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.

The data acquisition and analysis software works in MS-Windows environment and acquires real time data, elaborates them and stores them. It can display and print the data acquired and the quantities obtained by calculation and processes graphics which describe the trend of the calculated quantities. Moreover, instead of acquiring data from transducers, it is possible to insert data from the keyboard, allowing an independent use of the software.

4. Technical features

- Compressor power 470W
- Stainless steel calorimeter capacity 30l

5. Experiments

- Evaluation of the frigorific cycle performances.
- Study of the relation between the cooling effect and the temperature of the body to be cooled.
- Measurement of the absorbed engine power when the body temperature changes.
- Study of the frigorific cycle on the Mollier diagram
- Frigorific efficiency when the body temperature changes.

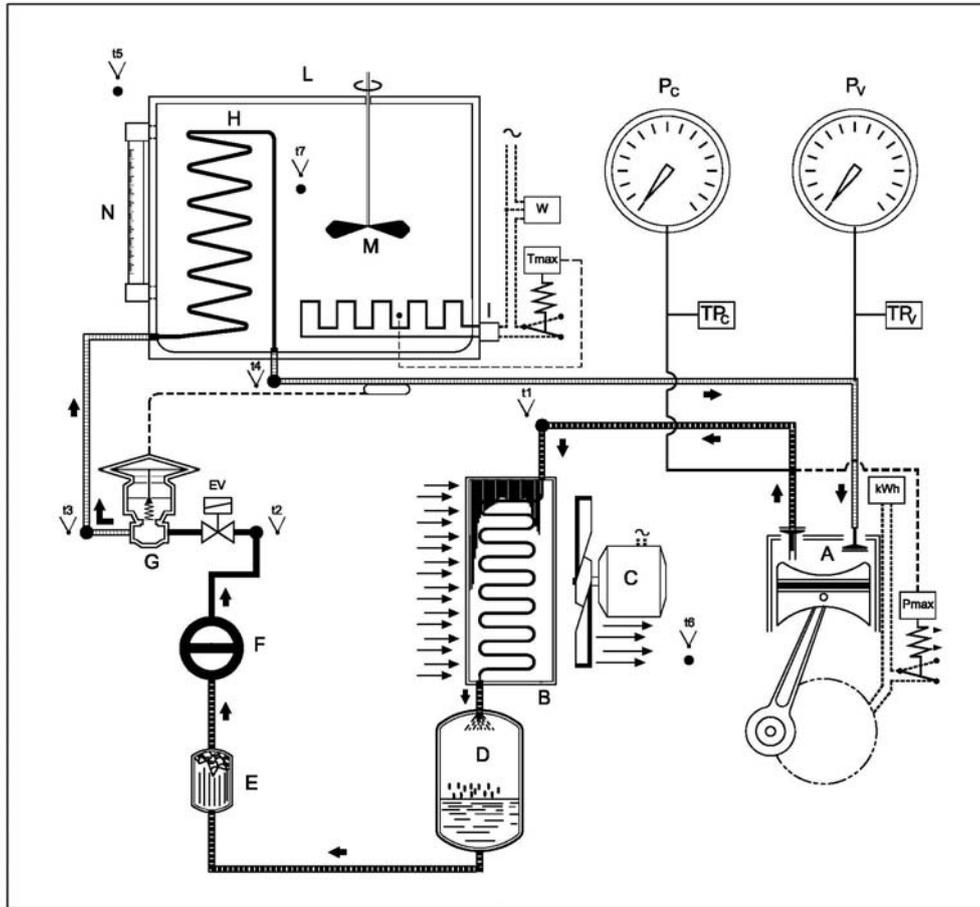
6. Services required

- Electric supply: 220 V mono phase, 50/60 Hz
- PC, Hard Disk available space 3 GB min., RAM 4 GB, CD/DVD, USB port.
- Microsoft Operating system.
- Graphic printer.

7. Weight and dimensions

- Dimensions: 600 x 600 x 1650 h mm
- Net Weight: 120 Kg

8. Synoptic



Keys:

- A. hermetic compressor
- B. condenser air/R404
- C. fan
- D. liquid basket
- E. dehydrating filter
- F. cooling fluid sight glass
- G. thermostatic isenthalpic expansion valve
- H. R404/ ethylene glycol coil evaporator
- I. adjustable resistance 0÷2000W
- L. calorimeter
- M. stirrer
- V1. suction pressure regulation valve
- 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 air inlet
- t6. temperature sensor: condenser air outlet
- t7. temperature sensor: water solution of ethylene glycol inside calorimeter
- Pc. pressure gauge for condensation pressure
- TPc. pressure transducer for condensation pressure
- Pv. pressure gauge for evaporation pressure
- TPv. pressure transducer for condensation pressure
- Pmax. maximum pressure switch
- Tmax. maximum temperature switch
- KWh. electric energy meter
- W. digital power indicator with regulation card
- EV separating liquid/gas solenoid valve

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In any time and without notice, Didacta Italia can carry out any appropriate modification on the product details, always maintaining their main features, according to the designing and teaching necessity.