1. General

The self-sufficient unit allows to perform experiments on water cooling by using 3 interchangeable cooling towers having packings with different heat exchange surface.

The unit is available in two versions:

- **T123D (Code 956000) – Basic unit in manual version**
- **T123D/C (Code 956001) – Computerized version unit** which allows, thanks to the electronic transducers and suitable software, to display and/or print on personal computer the tables of results and diagrams of the experiments.

2. Composition

The basic unit in manual version T123D (Code 956000) is composed of:

- No. 3 towers, 150 x 150 x 600 h mm, made of transparent plexiglas in order to allow full visibility of the water flow.
- Exchange surface 2.16, 1.68 and 0.337 m² respectively.
- Electrical centrifugal fan, 0 to 2000 m³/h, for air circulation, with shutter.
- Chamber for air distribution.
- Heater for air warming up.
- Transparent water collection tank, with 2 kW electrical heating resistors, fitted with thermostat and level control.
- Transparent calibrated tank to compensate the water loss due to evaporation, 10 l capacity.
- Water circulation pump, 30 W, fitted with regulation by-pass.
- Water flowmeter, 0-300 l/h.
- No. 9 thermoresistances, with selector switch and digital indicator, for temperature measurement.
- Differential micromanometer for determination of air flowrate and load losses in the tower.
- Electric control board.
The unit in computerized version T123D/C (Code 956001) is composed of:

- No. 3 towers, 150 x 150 x 600 h mm, made of transparent plexiglas in order to allow full visibility of the water flow. Exchange surface 2.16, 1.68 and 0.337 m² respectively.
- Electrical centrifugal fan, 0 to 2000 m³/h, for air circulation, with shutter.
- Chamber for air distribution.
- Heater for air warming up.
- Transparent water collection tank, with 2 kW electrical heating resistors, fitted with thermostat and level control.
- Transparent calibrated tank to compensate the water loss due to evaporation, 10 l capacity
- Water circulation pump, 30 W, fitted with regulation by-pass.
- Turbine type electronic flowrate transducer.
- No. 9 thermoresistances, with digital indicator and analog output, for temperature measurement.
- No. 2 electronic differential pressure transducers for determination of air flowrate and load losses in the tower.
- Feeding, signal conditioning and A/D conversion unit.
- Analysis and data acquisition software for Windows.
- Electric control board.

Fig. 1 Exchanged heat vs Air Flow

Fig. 2 Head losses vs Air Flow
3. Experiments
- Thermal balance in the tower
- Comparison for different packing
- Determination of the critical packing working conditions
- Determination of the air head losses with changing water flowrate.

4. Minimum PC Configuration Required
- PC minimum Pentium with Hard Disk (>10Gb) and CD drive, SVGA graphic card 800x600, mouse, RAM 32 MB, USB port;
- XP MS-Windows or later versions;
- Graphic Printer.

5. Required services
- Electrical supply: 220/240 V single-phase, 50/60 Hz, 4 kW

5. Weight and dimensions
- Dimensions: 1300 x 700 x 1250 h mm
- Net weight: 100 kg

Synoptic – Basic unit
A. Support
B. Cooling tower
C. Centrifugal fan
D. Air heater
E. Nebulizer
F. Control board
G. Calibrated tank
H. Water tank complete with:
   - discharge valve (1)
   - level control float valve (2)
   - by-pass valve (3)
• water circulation pump (4)
• minimum level control (LC)
• automatic temperature control (TC)
• heating resistance (RH)

I. Water flow rate measurement
   t1... t5   Thermoresistances
   t6-t6a, t7-t7a   Psychrometers
   Dp1, Dp2   Differential pressure measurements