

# STATION FOR STUDYING THE TEMPERATURE REGULATION OF A

## REFERENCE : HYDROTHERM



*Non contractual photo*

**SERVICE : SINGLE-PHASE POWER SUPPLY**

**220V, 15A + T.**

**DIMENSIONS : 1150 X 670 X 1470 MM**

**WEIGHT : 98KG**

The HYDROTHERM bench is designed for the study of the general principles of electrothermal energy. It is able to perform temperature control in several ways.

The bench includes the various control, instrumentation and control loops.

A disturbance circuit makes it possible to highlight the response of the method.

The bench is designed to operate completely independently of the distribution network. It allows to develop a large number of themes :

### Temperature sensor

- Sensor performance (response time, linearity, hysteresis).
  - Justification of power supply by a current generator.
  - Justification of a connection by 3 wires.
  - Energy modulation.
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- Principle of operation of modulators.
  - Peak intensity problem at startup.
  - Performance of modulators: Static power units.Wave train radiators.
  - Operating cycle, service life.
  - Determination of heating power.
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- Calculate the heating power.
  - Observe the influence of the temperature when bringing a cold room.
  - Experimental determination of coefficient of loss.
  - Distribution of the temperature in the bench.
  - Influence of the water level.
  - Temperature regulation.
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- Automatic regulation methods.
  - Staple batch adjustment.
  - Regulator P.
  - PI regulator.
  - PID regulator.
  - Self-adaptive PID controller.
  - Process response.
  - Temporal analysis.
  - Influence of the settings, the body of water, the disturbance.
  - The bench meets the benchmark of the technological baccalaureate, STI series, electrical engineering, but can find its place among the equipment of the automatic laboratory and industrial computer of the mechanical specialty.

### Technical specifications :

## **Operative part**

- The bench consists of a mobile chassis incorporating :
- A reservoir comprising:
- An immersion heater.
- A temperature sensor.
- A "low level" security. A safety thermostat. A centrifugal pump.
- An air cooler allowing the creation of a disturbance in the regulation loop conferring on the system the following advantages:
- Repeatability of manipulations, without waiting for the natural cooling of the water.
- System free of any water connection with the network.
- Control and control part

## **An electrical box includes :**

- The devices supply and protection of the installation: circuit breaker, contactor, fuses, transformer.
- The heating modulator: 1 unit of power per wave train.
- A dimmer (supplied as an option) can be connected to the side of the cabinet (use of a dimmer other than the option is possible).
- A converter,
- The control organs,
- An adaptive PIDauto regulator,
- A thermostat.
- The regulator and the thermostat are integrated in a silkscreened synoptic on the front of the cabinet.
- The synoptic integrates, also, various measurement points allowing the study of control loops.
- These isolated measuring points of the supply network are:
- Instantaneous voltage,
- Instantaneous current,
- Storage,
- Effective power,
- Storage,
- On / off control signal, - Analog control signal, - Temperature.
- The controller and the power unit are disconnectable and available for separate component study:
- Study of the converter,
- Unplugging the regulator for external use with HYDROTHERM,
- Replacement of power units (wave train) by an external dimmer (wave cutting),
- A switch allows to choose the type of temperature control, either by thermostat or by regulator PID.