



HYDROELECTRIC PLANT WITH PELTON TURBINE



DL PS-HYDROPOWER

This equipment reproduces a small-scale hydropower plant, equipped with a Pelton turbine providing full operation and complete with all the necessary accessories.

It helps the students to observe and interpret accurately how a hydropower plant operates.

It simulates the operation of a power generator, considering the hydraulic head of a reservoir, whereby water potential energy is transformed into electricity thanks to the operation of a turbine.

The turbine is equipped with measuring devices to monitor the motor torque and the speed which enables the mechanical energy retrieved and the mechanical and electrical power efficiency rate.

Furthermore, there is a digital pressure transducer at the turbine inlet and a flowmeter which enables the calculation of the hydropower energy.

TRAINING OBJECTIVES

Turbine characteristic curves:

- Torque-rotation speed (M-n),
- Brake power-rotation speed (Pe-n),
- Efficiency-rotation speed (η -n),
- Torque-Voltage (M-U),
- Brake power- Voltage (Pe-U),
- Efficiency- Voltage (η -U).

Operation's study of hydraulic power installation:

- Operation with different types of DC loads,
- Conversion from DC to AC,
- Operation with different types of AC loads,
- Installation efficiency.

Determination of the electrical generation characteristics of the turbine depending on rotation speed:

- Curve intensity-Voltage,
- Short circuit current,
- Open circuit voltage,
- Power curve-Voltage,
- Power curve-load resistance,

TECHNICAL DATA

Turbine:

- Type: Pelton,
- Number of blades: 16,
- Wheel diameter: 124 mm,
- Bucket depth: 14 mm,
- Jet diameter: 10 mm,
- Shaft diameter: 16 mm,
- Rated speed: 1000 rpm,
- DC generator,
- Approx. power: 50 W,
- Transparent front plate to visualize the Pelton wheel working,
- Stainless steel housing and shaft, polyamide wheel.

Structure:

- The equipment is provided on an aluminum frame with tank and pump in which the required flow for the turbine is generated.

Pump:

- Maximum manometric height: 23 mWC* (m_{H_2O}),



FLUID MECHANICS

- Maximum generated power,
- Form factor and Efficiency.

The equipment can be connected to a PC through USB port to register and save the data directly on tables.

The user manual, supplied with the equipment, shows clearly and with many images, the entire process to follow for operating the equipment, and explains all the theoretical foundations as well as the mathematical formulas used for carrying out all the experiments.

- Flow: 10 ÷ 160 l/min,
- Manometric height: 21 ÷ 10 mWC* (m_{H2O}),
- Consumed power: 750 W (1 HP),
- Maximum power: 950 W,
- Speed: 2900 rpm.

*: **meter water column**

Components:

- Pressure transducer,
- RPM direct detection sensor,
- Load cell for the torque,
- Electronic control unit for data monitoring,
- Battery charge controller:
 - ◆ 12 or 24 Vdc,
 - ◆ Max. current: 10A,
 - ◆ Max. input voltage: 45V.
- Battery: 12V/12Ah,
- Off-grid inverter with single-phase output: 200VA,
- Digital ammeters,
- DC lamps module,
- AC lamps module,
- Rheostat.

REQUIREMENTS

- Power supply: single-phase from the mains, 50/60Hz.