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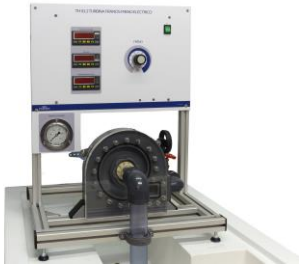
TH 03.1 - ELECTRIC BRAKE PELTON TURBINE (pag. B - 4)



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FL 03.1 - SERIES AND PARALLEL PUMPS

With this equipment, a large list of the operations can be carried out, both start-up, operation and regulation necessary in a pumping installation.

One of the pumps is controlled by a frecuency inverter, which allows the speed of rotation to be varied. This pump has also a measurement system of mechanical torque.

The flow rate is measured by an electronic flow meter.

In addition, the study of the characteristics of a pump can be carried out, working individually and in a group, in series or in parallel, carrying out a wide range of experiments and experiences.

FL 03.2 - CENTRIFUGAL PUMPS CHARACTERISTICS

The equipment is designed to operate on hydraulic bench. The installation is mounted on a frame constructed of aluminum, with a system of pipes and valves that allow it to be coupled hydraulic pump and bank equipment in series or in parallel.

The equipment has a frequency converter for controlling the speed of rotation of the pump. Also has two wattmeter for obtaining the power consumed by both pumps.

Through the study of the characteristics of centrifugal pumps is demonstrated the operation and functioning and factors affecting their efficiency.

FL 07.1 - AXIAL FAN

This equipment has been developed for the study of the characteristics of an axial fan, performing a range of experiments and experiences.

The unit has a digital display of revolutions that lets us know the working speed of the fan at all times in a simple manner. This speed is regulated by the control.

Similarly pressure transducers measure the working pressure in each tapping under study through its digital displays and boosting practical experience.

Pressure taps are sealed to prevent leaks that distort the readings taken.

Besides using the speed regulation for modifying the flow of work equipment also it has an IRIS type valve that can vary the airflow through the conduit.

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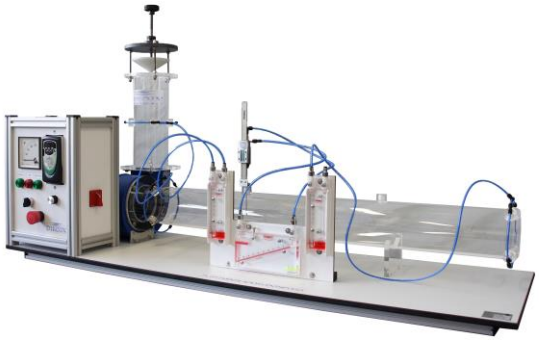
FL 07.2 - CENTRIFUGAL FAN



This equipment has been developed for the study of the characteristics of a centrifugal fan, through the realization of a wide range of experiments and experiences.

A pitot tube allows the measurement of air velocity at any diametral point of the tube, measuring the position of the tube through a digital display.

The vertical and inclined manometers allow a correct reading of the pressures.

The equipment is supplied with 2 different impellers (blades tilted forward and backward), which can be exchanged in a very simple way. Through a control of 3 positions we control the direction of rotation of the motor.

The frequency shifter allows the variation of the speed of rotation, while we observe the consumed electrical power in a wattmeter.

Through a conical cap in the air outlet we can cause an adjustable pressure drop, and study the operating points of the fan.

MH 01.1 - CENTRIFUGAL PUMP DEMONSTRATION UNIT

The Centrifugal Pump Demonstration unit makes it possible to carry out a range of operations, either for the start-up or the operation itself of a pump station. The study of how a single pump works is available through the following coursework and laboratory experiments:

- Study and production of the centrifugal pump characteristic curve.
  - Head-flow (H-Q).
- Modification of the operation point by varying the settings of the pump installation.
  - Adjusting the discharge valve.

The pump is equipped with a transparent volute to provide a clear view of the whole operation process.

MH 05.1 - VISUALIZATION NPSH EQUIPMENT

Cavitation is produced when a liquid that is being pumped loses pressure and matches the level at which vapour is generated at the same temperature the pump is operated. At that moment, liquid turns into vapour, giving rise to vapour locks or vacuum pockets that are pushed into other areas with a higher pressure. Very fast condensation takes place creating short-lived excess of pressure in very small places.

The outcome is strong vibration of the device, rust, parts of the metal being chipped off and a sudden loss of head, all of which interferes with the performance of the machine.

The MH 05.1 VISUALIZATION NPSH equipment has been designed to clearly observe this phenomenon in real time, as it takes place inside the impeller of the pump.

A stroboscope is placed in front of the cut out pump and its frecuency is adjusted to the spinning speed of the pump. This way we can observe the formation of bubbles inside the impeller as if it were still, providing a superb experience.

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TH 01.1 - FRICTION BRAKE PELTON TURBINE

The TH.01.1 equipment simulates an instalation in a small scale with a Pelton turbine. It has been designed with special emphasis on the didactic aspect of the same, being able to observe at all times the operation of the system and the different components that constitute it.

The turbine housing is transparent so that you can see how the turbine uses the inertia that transfers a jet of water, which drives it by the principle of recoil.

The equipment is endowed with different variable components, which allows to vary the facings that affect the mechanism and thanks to it to be able to realize different tests for a better understanding of the student.

It has a regulating valve for water inner, which allows to work with different flow rates as required.

Regarding to the braking system, it is made up of dynamometers that allow the braking force to be operated at different speeds.

TH 01.2 - FRICTION BRAKE FRANCIS TURBINE

The TH 01.2 equipment simulates a small-scale installation with a Francis turbine. It is designed with an emphasis on teaching aspect of it, being able to observe at all time the operation of the system and the different components that constitute it.

Among its most notable features we might mention that the turbine housing is transparent so the aid you can see how the water flow turns the wheel. In this case, besides the rotation of the wheel, the movement of the fins guide the distributor with which the flow regulation turbine inlet is achieved is also observed. Additionally, the student can visualize the impact of the fluid on the blades, besides being able to make the necessary data gathering to perform the experiments successfully.

It provides a regulating valve of water inlet, which allows working with different flows as required, making it possible to perform many tests as they are needed. The pressure at the inlet of the turbine is also known as measured by Bourdon gauge included in the team and whose management is specified in the manual itself not to lead to errors in the readings.

Furthermore, the braking system by dynamometers allows working at different speeds according to the braking force, which can be easily known through dynamometers that are incorporated in the teaching equipment.

TH 01.4 - FRICTION BRAKE KAPLAN TURBINE

The TH 01.4 equipment simulates a small-scale installation with a Kaplan turbine.

The equipment comes with 3 propellers with different input and output angles, which can be exchanged quickly and easily.

The equipment is designed for the study and display both the behavior and the characteristics of a Kaplan turbine.

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TH 03.1 - ELECTRIC BRAKE PELTON TURBINE

The TH 03.1 equipment simulates a small-scale installation with a Pelton turbine.

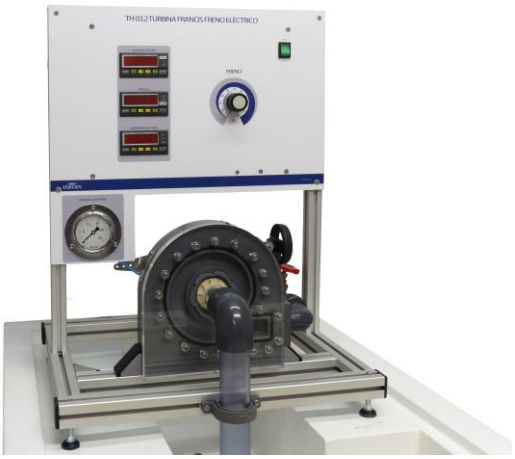
The turbine housing is transparent so that can be viewed as the turbine uses the inertia that transfers a water jet which propels the recoil principle.

Through various system indicators, you can view all the variables that come into play in transforming energy.

The braking system by electric brake allows working at different speeds in a simple and effective way.

The equipment is designed for the study and display both the behavior and the characteristics of a Pelton turbine.

TH 03.2 - ELECTRIC BRAKE FRANCIS TURBINE



The TH 03.2 equipment simulates a small-scale installation with a Francis turbine or reaction.

The equipment is designed for the study and display both the behavior and the characteristics of a Francis turbine.

Among its most notable features include the turbine housing is transparent so you can see how the water flow turns the wheel. In this case, besides the rotation of the wheel, the movement of the vanes guide the distributor with which the flow regulation turbine inlet is achieved is also observed.

The braking system with electric brake allows to work at different speeds in a convenient and simple way. The rotational speed of the engine control by a rheostat included in the top control module, where, in addition, through the various indicators of the system, you can display all variables that come into play in transforming energy.

Regulating valve has water inlet, which allows working with different flows as required. Pressure turbine inlet is read in a vacuum gauge arranged on the structure.

TH 03.4 - ELECTRIC BRAKE KAPLAN/PROPELLER TURBINE

The TH 03.4 equipment simulates a small-scale installation with a Kaplan turbine.

The wheel blades of the turbine allow variation of the pitch angle manually.

Through various system indicators, you can view all the variables that come into play in transforming energy.

The equipment is designed for the study and display both the behavior and the characteristics of a Kaplan turbine.

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TH 04.1 - AUTONOMOUS ELECTRIC BRAKE PELTON TURBINE

The TH 04.1 equipment simulates a small-scale installation with a Pelton turbine.

The turbine housing is transparent so that can be viewed as the turbine uses the inertia that transfers a water jet which propels the recoil principle.

Regulating valve has water inlet, which allows working with different flows as required.

The braking system by electric brake allows working at different speeds.

The equipment is computerized which means that the inlet pressure to the turbine, the flow, the braking torque, ultimately, all variables are displayed in the integrated team structure computer.

TH 04.2 - AUTONOMOUS ELECTRIC BRAKE FRANCIS TURBINE

The TH 04.2 equipment simulates a small-scale installation with a Francis turbine or reaction. It is designed for the study and display both the behavior and the characteristics of a Francis turbine.

Among its most notable features include the turbine housing is transparent so you can see how the water flow turns the impeller. In this case, besides the rotation of the impeller, the movement of the fins guide the distributor with which the flow regulation turbine inlet is achieved is also observed.

Regulating valve has water inlet, which allows working with different flows as required.

The braking system by electric brake allows working at different speeds.

The equipment is computerized which means that the inlet pressure to the turbine, the flow, the braking torque, ultimately, all variables are displayed in the integrated team structure computer.

The turbine can be operated completely autonomously, thanks to the team is composed of water tank, pump and all the necessary instruments on a laboratory trolley.

TH 04.4 - AUTONOMOUS ELECTRIC BRAKE KAPLAN TURBINE

The TH 04.4 simulates a small scale installation with a Kaplan turbine.
The equipment is designed for the study and visualization of both the behavior and the characteristics of a Kaplan turbine.

Turbine impeller blades allow for varying the pitch angle manually.

It has a water inlet regulation valve, which allows working with different flow rates as required.

The electric brake braking system allows working at different revolutions.

The turbine can be operated in a totally autonomous way, thanks to the equipment is composed of water tank, pump and all the necessary instruments, on a mobile laboratory car.

Through the different indicators of the system, you can see all the variables that come into play in the transformation of energy.

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