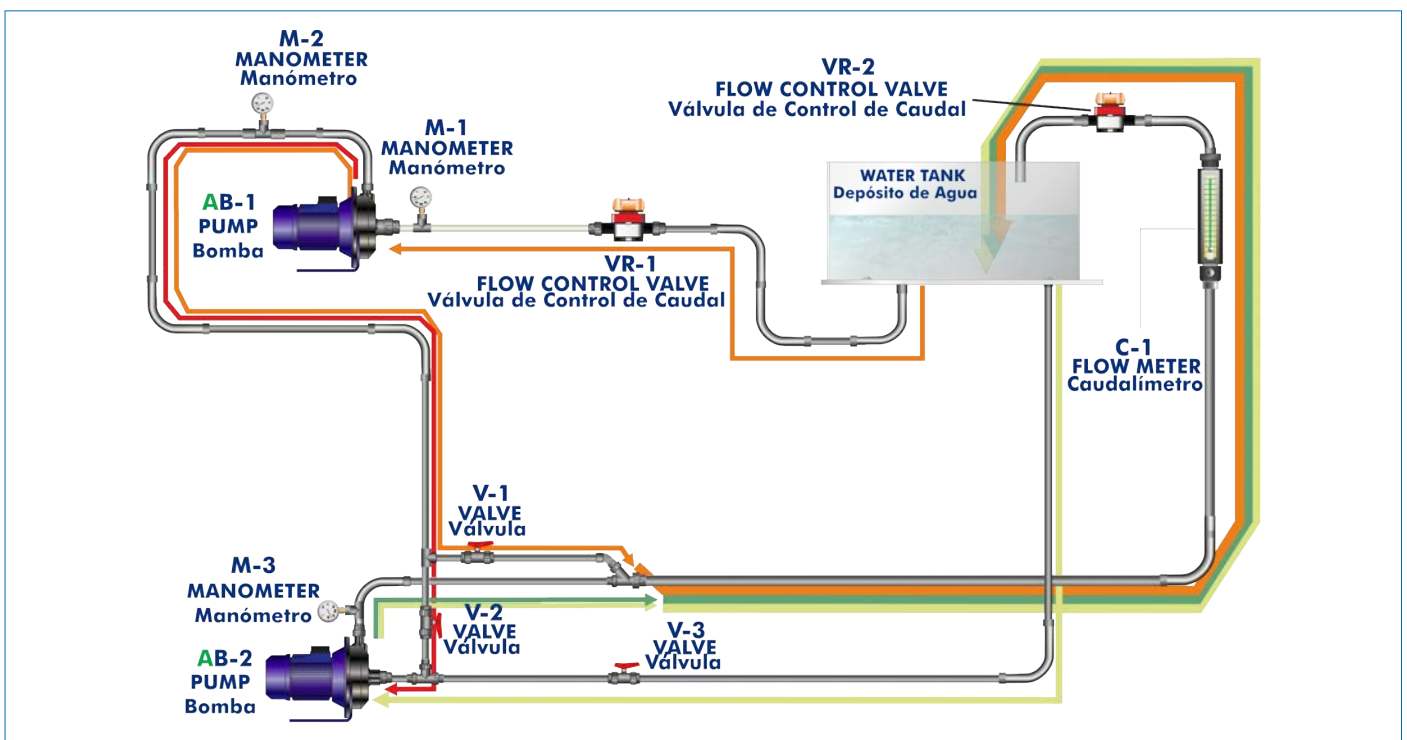




Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)



European Union Certificate (total safety)



Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)



Certificate and Worlddidac Member

INTRODUCTION

A hydraulic pump is a generator machine that is able to communicate energy to the fluid that circulates through its interior. This way, the fluid can overcome the geometric difference or the adverse gradient of pressures that could exist between two points of a hydraulic net.

Among all the hydraulic machines, pumps are the most versatile, because it is possible to adapt them to a great diversity of conditions of exploitation (powers, flows, elevation heights, liquids, materials, etc.).

The form of the impeller element determines the type of pump and gives to it specific characteristics. The most common types of pumps, according to the impeller element, are those of positive or volumetric displacement and the rotodynamic ones.

The first type of pump (gear, pistons, numberless screw pumps, etc.) confines a finite volume of fluid between their mechanical components, and once it is tightly enclosed they displace the fluid or impel it towards the area of larger pressure. In this type of pumps there is, therefore, a clearly defined physical border between the area of high pressure and that of low pressure.

The second type (axial, diagonal, radial pumps, etc.) achieves the increase of pressure by forcing the fluid to move through the divergent ducts that lay between the vanes of the runner by the effect of the centrifugal force, to which the fluid is subjected with the turn of the runner or instigator. As a consequence, in this type of pumps there is not a clearly defined physical border between the area of high pressure and that of low pressure, but the pressure increases progressively as the fluid advances.

The rotodynamic pumps are normally the most commonly used. The field of use of these pumps grows every day, and with them we obtain drive ranging from large flows and small heights to small flows and large heights, and every situation in between.

The regulation of the flow in the rotodynamic pumps is very simple and can be approached in very different forms, by varying the turn speed, adjusting shift keys in series or in parallel, etc. This wide range of possibilities that exists to modify the pump's point of operation allows its easy adaptation to the different work situations that it can face during its life. The placement of pumps or impellers in series or in parallel broadens the scope of application of the rotodynamic pumps, invading the area of volumetric pumps, which are used almost exclusively for applications of small flows and large working pressures.

Due to the great importance that this type of pumps has in the industry, it is necessary for the technicians of the industry to know its behavior well. With the Series/Parallel Pumps Bench, "PBSPB", the parameters and most important characteristic of this type of pumps operating alone as well as coupled in series or in parallel will be obtained.

Since the unit has a speed regulation, you can obtain the point of design of each pump and the characteristic curves of the series-parallel coupling for similar pumps (rotating at the same speed) and for different pumps (rotating at different speeds).

GENERAL DESCRIPTION

The Series/Parallel Pumps Bench, "PBSPB", is designed to demonstrate the operational advantages of parallel or series operation, depending on the required duty.

This unit consists of two centrifugal pumps, a feed water tank, circulation pipes, regulation valves, three pressure meters and a flow meter. The centrifugal pumps can operate: alone, coupled in series or in parallel. A three-phase motor activates a pump with possibility of adjustment and measurement of the turn speed as well as of the transmitted mechanic torque; and a single-phase motor activates the other pump.

The pumps are installed in a pipes system, which, as it is a closed circuit, avoids the permanent waste of water during the operation.

By the appropriate positioning of the valves it is possible to connect the pumps individually, in series or in parallel, depending on which test is going to be performed.

SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

Main metallic elements made of stainless steel.

Diagram in the front panel with distribution of the elements similar to the real one.

Two centrifugal pumps:

Maximum flow: 120 l/min.

Maximum height (approx.): 25 mwc (meter of water column).

A three-phase motor activates a pump, 0.37 kW with continuous adjustment with inverter of frequency/voltage; and other single-phase motor activates the other pump.

Three valves that allow for connecting the pumps separately, in series or in parallel depending on their appropriate position.

Two flow regulating valves.

Water tank, capacity: 60 l.

Torque measurement and speed measurement.

Discharge pressure manometer; range: 0 – 2.5 bar.

Discharge pressure manometer; range: 0 – 6 bar.

Admission pressure manometer; range: -1 – 1 bar.

Flow meter; range: 0 – 150 l/min.

Electronic console:

Metallic box.

Pumps switches.

Speed controller.

Speed measurement digital display.

Torque measurement digital display.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.



PBSPB detail

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Obtaining of curves $H(Q)$, $N(Q)$, $Eff\%(Q)$.
 - 2.- Obtaining of the map of a centrifugal pump.
 - 3.- Adimensional study of magnitudes H^* , N^* and Q^* .
 - 4.- Cavitation test and obtaining of curves $NPSH_c$.
 - 5.- Series coupling of two pumps with same characteristics.
 - 6.- Series coupling of two pumps of different characteristics.
 - 7.- Parallel coupling of two pumps with same characteristics.
 - 8.- Parallel coupling of two pumps of different characteristics.
- Additional practical possibilities:
- 9.- Sensors calibration.

REQUIRED SERVICES

- Electrical supply: single-phase, 220 V/50 Hz or 110 V/60 Hz.
- Water supply and drainage.

DIMENSIONS AND WEIGHTS

PBSPB:

Unit:

- Dimensions: 1530 x 700 x 800 mm approx.
(60.23 x 27.55 x 31.49 inches approx.)
- Weight: 105 Kg approx.
(231.5 pounds approx.)

Electronic console:

- Dimensions: 490 x 330 x 310 mm approx.
(19.3 x 13 x 12.2 inches approx.)
- Weight: 10 Kg approx.
(22 pounds approx.)

AVAILABLE VERSIONS

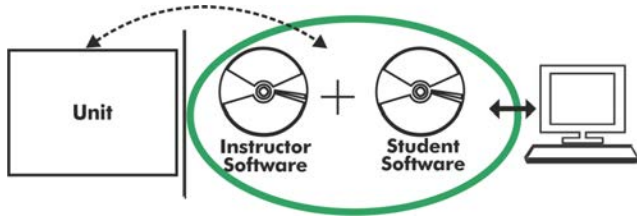
Offered in this catalogue:

- PBSPB. Series/Parallel Pumps Bench.

Offered in other catalogue:

- PBSPC. Computer Controlled Series/Parallel Pumps Bench.

PBSPB/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer (PC), this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

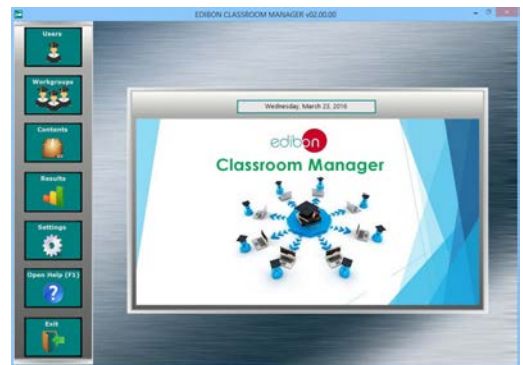
Instructor Software

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

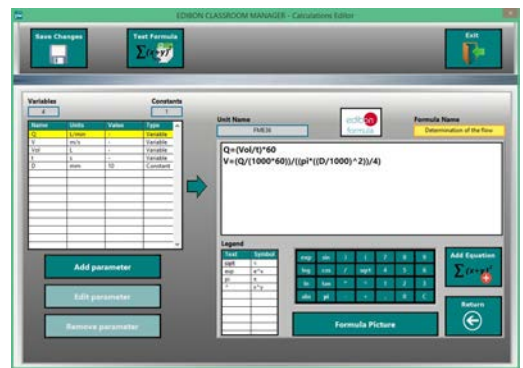
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

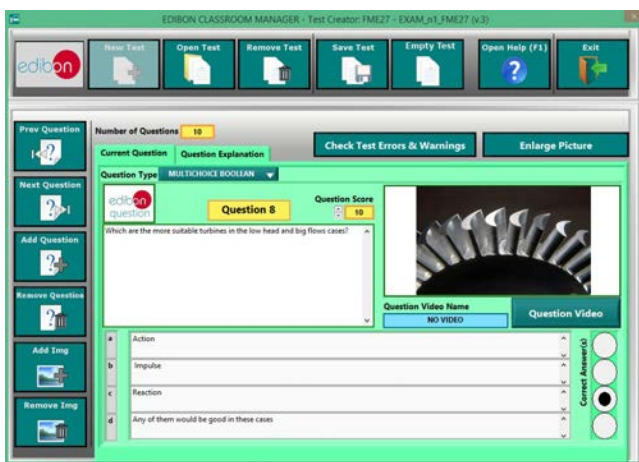
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- Updatable Contents.
- Report generation, User Progression Monitoring and Statistics.



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

Optional
Student Software

- **ESL-SOF. EDIBON Student Labsoft (Student Software).**

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

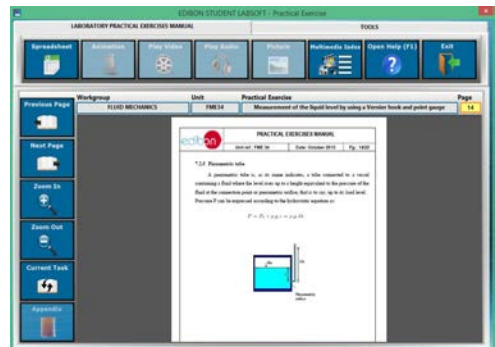
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

For more information see ICAI catalogue. Click on the following link:

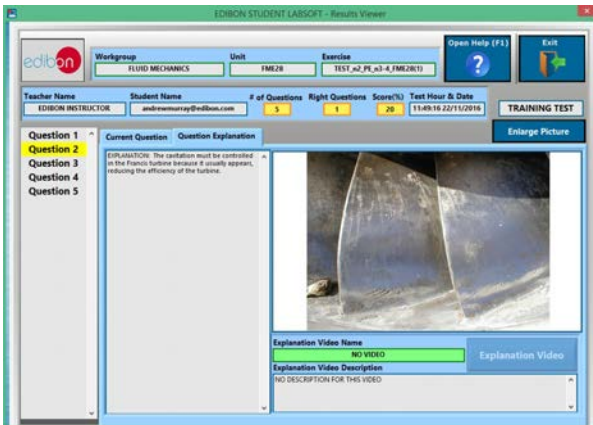
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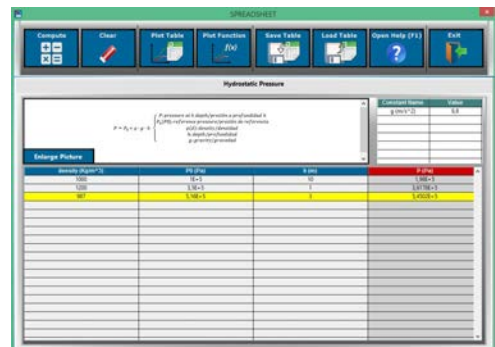
ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

* Specifications subject to change without previous notice, due to the convenience of improvement of the product.



C/ Del Agua, 14. Polígono Industrial San José de Valderas.
28918 LEGANÉS. (Madrid). ESPAÑA - SPAIN.
Tel.: 34-91-6199363 Fax: 34-91-6198647
E-mail: edibon@edibon.com Web: www.edibon.com

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REPRESENTATIVE:

