Flow Visualization Aerodynamic Tunnel

TAVF180/100

Included elements

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION

AIR OUTLET
Salida de Aire

AVE-1
FAN
Ventilador

SV-1
SPEED SENSOR
Sensor de Velocidad

WORKING AREA
Área de Trabajo

V-2
VALVE
Válvula

MODEL
Módelo

SMOKE GENERATOR
Generador de Humo

AL-1
LED LIGHTING
Iluminación LED

TRANSPARENT SCREEN
Pantalla Transparente

COMB
Peine

V-1
VALVE
Válvula

AIR STRAIGHTENER
Enderezador de Fluja

AIR INLET
Entrada de Aire
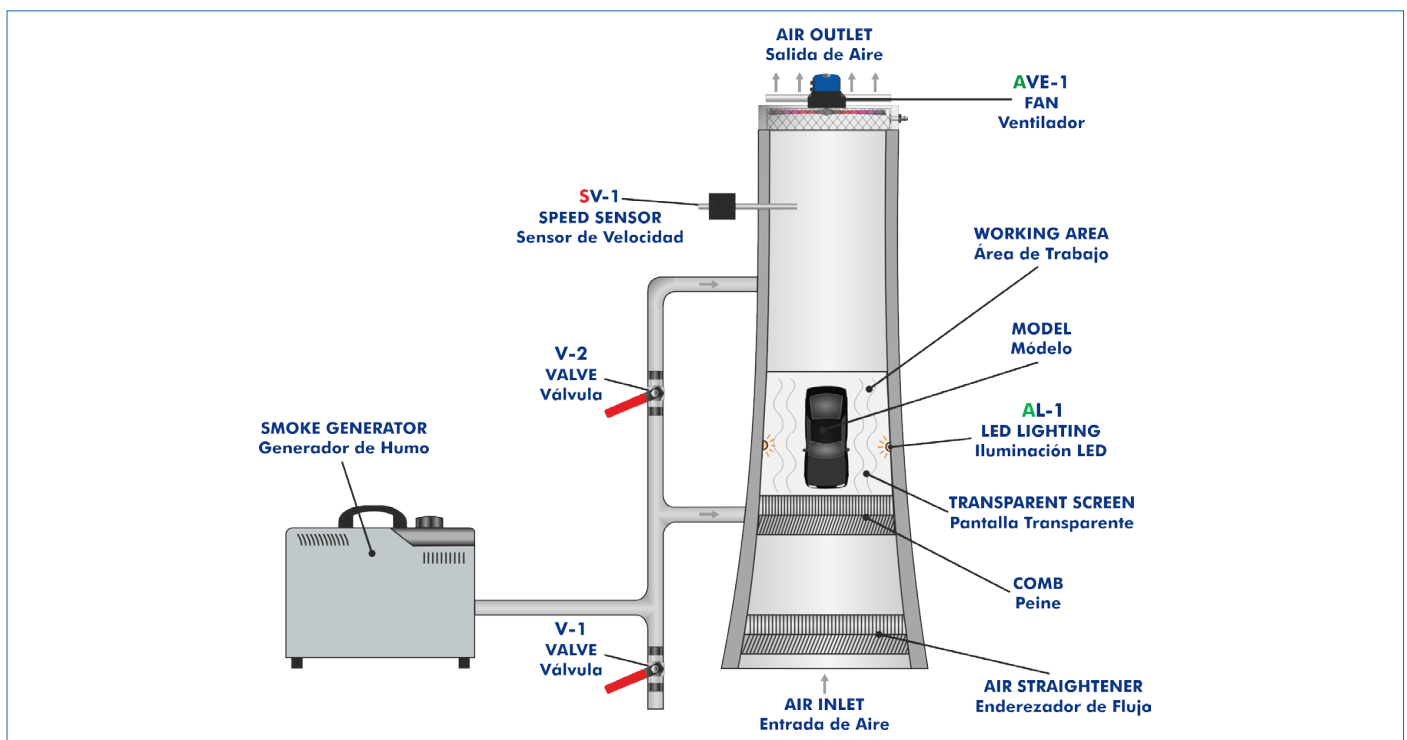
INTRODUCTION

One of the most important parts of fluid mechanics is aerodynamics. Aerodynamics provides knowledge of the forces on moving solids and the behaviour of the gases around them. This knowledge is of great use, for example, in the automobile, aeronautical or ballistic industries.

The principles of aerodynamics are present in most of our everyday activities, from kicking a ball to the take-off and stabilisation of an aircraft. When we move or make an object to move, a large number of unnoticed physical principles come into play.

In order to become fully aware of these phenomenon, flow visualisers appear, which make it possible to easily and clearly observe the trajectory generated by moving bodies. This visualisation is produced thanks to the generation of an upward flow that passes through the solid to be studied, which is at repose.

GENERAL DESCRIPTION

The Flow Visualization Aerodynamic Tunnel, "TAVF180/100", designed by EDIBON, consists of a vertical conduction in which an upward flow of air and smoke is induced, which passes through different models allowing to study the behavior of the flow around it. Thus it is possible to evaluate the aerodynamics of different geometries by observing the phenomena related to their boundary layer and the formation of rotational flow.

The wind tunnel is located at the suction of the fan, obtaining a laminar flow that is not affected by the rotation of the blades. In addition, the fan has a variable rotation speed allowing to vary the airflow in the working section, obtaining wind speeds from 0 to 5 m/s.

The working section consists of a transparent screen and additional LED lighting from the sides for a perfect visualization of the flow. Before the working section the air passes through a filter and a variable position flow straightener that creates defined smoke lines to favor the observation of the fluid dynamics around the models.

The Flow Visualization Aerodynamic Tunnel, "TAVF180/100", includes a total of fourteen elements with different geometries for the study of aerodynamics, visualizing the flow lines: rounded shapes (cylinders and hemispheres), through orifices (slotted orifice, disc and circular orifice), commercial airplane wing profile (NACA 2412 and NACA 0015), in different vehicles (car, truck, van, and car with spoiler), and through a valve (ISA nozzle). The front part of the working section is removable for easy exchange of the models.

At the entrance of the tunnel there is a fog generator, in which a harmless smoke is generated, which is aspirated together with air through the tunnel thanks to the fan located at the exit. The smoke is produced by the heating and evaporation of a special liquid that, although it is innocuous, requires a ventilated environment to avoid the accumulation of smoke in the room.

The additional recommended element (not included), Set Additionnel d'Accesoires pour TAVF180/100, "TAVF180/100-AS", allows a greater number of experiments. This set includes a 90° elbow, a cascade corner, a flat corner and a bench of tubes similar to a casing and tube exchanger.

SPECIFICATIONS

Anodized aluminum frame and panels made of painted steel.

The unit includes wheels to facilitate its mobility.

Main metallic elements made of stainless steel.

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

Vertical wind tunnel for flow visualization.

Variable speed fan:

   Maximum flow rate: 325 m³/h.

   Speed in working section: 0 – 5 m/s.

Working area with transparent window for process visualization:

   Dimensions of the working area: 180 x 100 x 240 mm.

   Additional LED illumination for optimal visualization.

   Easily removable transparent screen.

Flow straightener (comb): 23 strands with 7 mm spacing.

Smoke generator:

   Power: 900 W.

Air velocity sensor, range: 0 – 20 m/s.

We include solids with various three-dimensional geometries, in order to observe different aerodynamic trajectories. These bodies are:

   Aerodynamic profile NACA 2412.

   Aerodynamic profile NACA 0015.

   Cylinder.

   Semi-sphere.

   Sphere.

   Slotted orifice.

   Disc.

   Circular orifice.

   Tip of an airplane wing.

   ISA nozzle.

   Model of car and sports car with spoiler.

   Truck and van model.

Operation conditions:

   Well ventilated laboratory.

   Storage temperature, range: -25 °C – 55 °C.

   Operating temperature, range: 5 °C – 40 °C.

   Maximum humidity: 80 % at temperatures below 31 °C decreasing linearly to 50 % at 40 °C.

   Maximum sound level: 70 dB.

Control panel:

   Metallic box.

   Fan switch.

   Fan regulator.

   Digital display for air velocity.

   Main switch.

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

Additional recommended elements (Not included):

   - TAVF180/100-AS. Additional Accessories Set for TAVF180/100.

TAVF180/100 detail

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of the aerodynamics in a commercial aircraft wing profile (NACA 2412 and NACA 0015 aerodynamic profiles).

2.- Study of the rotational flow in rounded shapes (cylinder and hemispheres).

3.- Study of flow through orifices (slotted orifice, disc, and circular orifice).

4.- Study of the turbulent phenomena that occur in the final part of the wing of an aircraft.

5.- Study of the flow through a valve (ISA nozzle).

6.- Study of the aerodynamics in different types of vehicles (car model, car with spoiler, truck and van).

7.- Study of the aerodynamics of a spoiler (sports car with wing).

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.

DIMENSIONS AND WEIGHTS

TAVF180/100:
  - Dimensions: 600 x 600 x 2200 mm approx.
                 (23.62 x 23.62 x 86.61 inches approx.)
  - Weight: 50 Kg approx.
                 (110 pounds approx.)

ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- TAVF180/100-AS. Additional Accessories Set for TAVF180/100.

SIMILAR UNITS AVAILABLE

Offered in this catalog:

- TAVF180/100. Flow Visualization Aerodynamic Tunnel.

Offered in other catalogs:

- TADV225/450. Aerodynamic Tunnel for Flight Demonstration.
- TA1200/1200C. Computer Controlled Aerodynamic Tunnel, 1200x1200 mm.
- TA300/300C. Computer Controlled Aerodynamic Tunnel, 300 x 300 mm.
- TA300/300. Aerodynamic Tunnel, 300 x 300 mm.
- TA50/250C. Computer Controlled Aerodynamic Tunnel, 50 x 250 mm.
- TA50/250. Aerodynamic Tunnel, 50 x 250 mm.
- TAS25/100C. Computer Controlled Supersonic Wind Tunnel.

TAVF180/100/ICAI. Interactive Computer Aided Instruction Software:
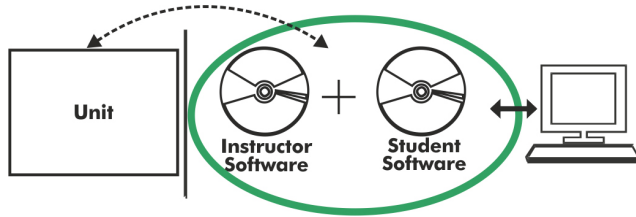

With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment 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.
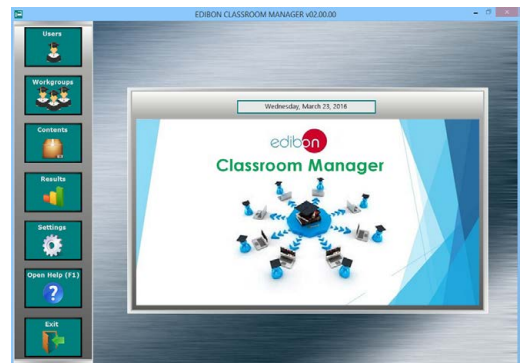
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen
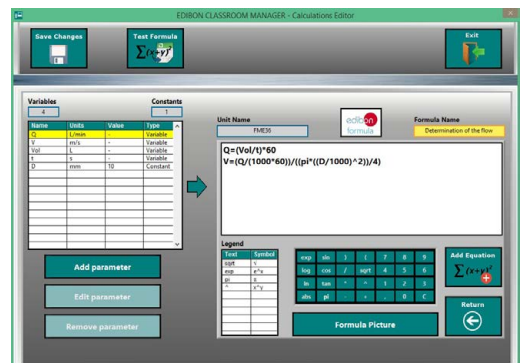
ECAL. EDIBON Calculations Program Package - Formula Editor Screen
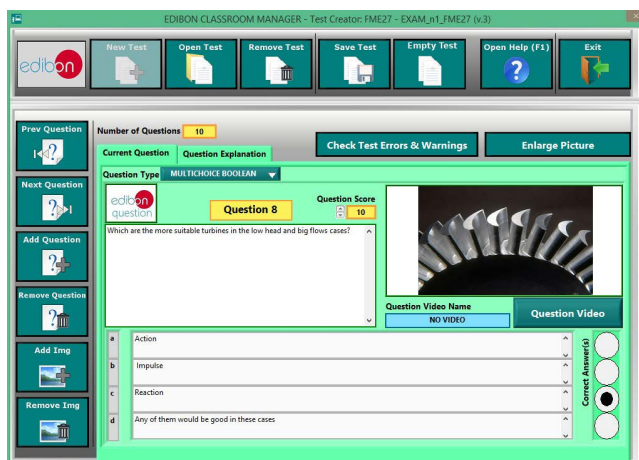
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

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

www.edibon.com

<u>Student Software</u>

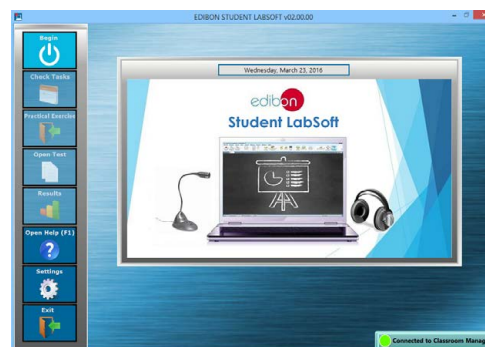## - ESL-SOF. EDIBON Student Labsoft (Student Software).

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.

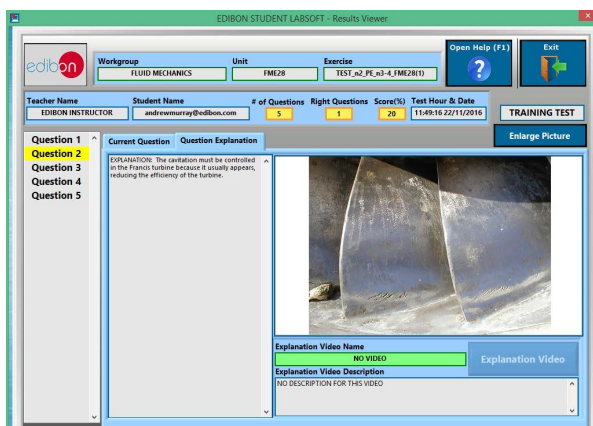For more information see **ICAI** catalogue. Click on the following link:

www.edibon.com/en/interactive-computer-aided-instruction-software
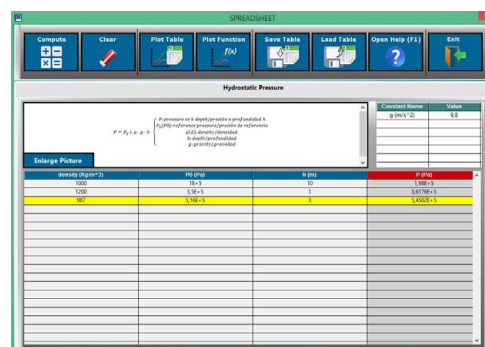
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen
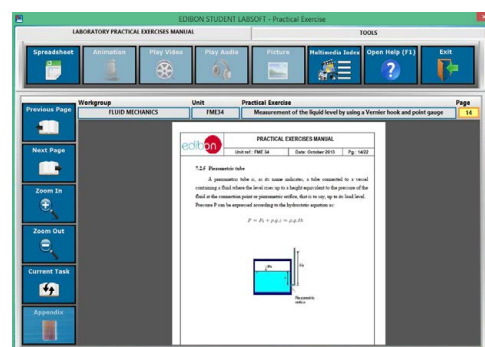
EPE. EDIBON Practical Exercise Program Package Main Screen

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.

REPRESENTATIVE:

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