



Engineering and Technical
Teaching Equipment

Wind Tunnel Flight Demonstration Unit

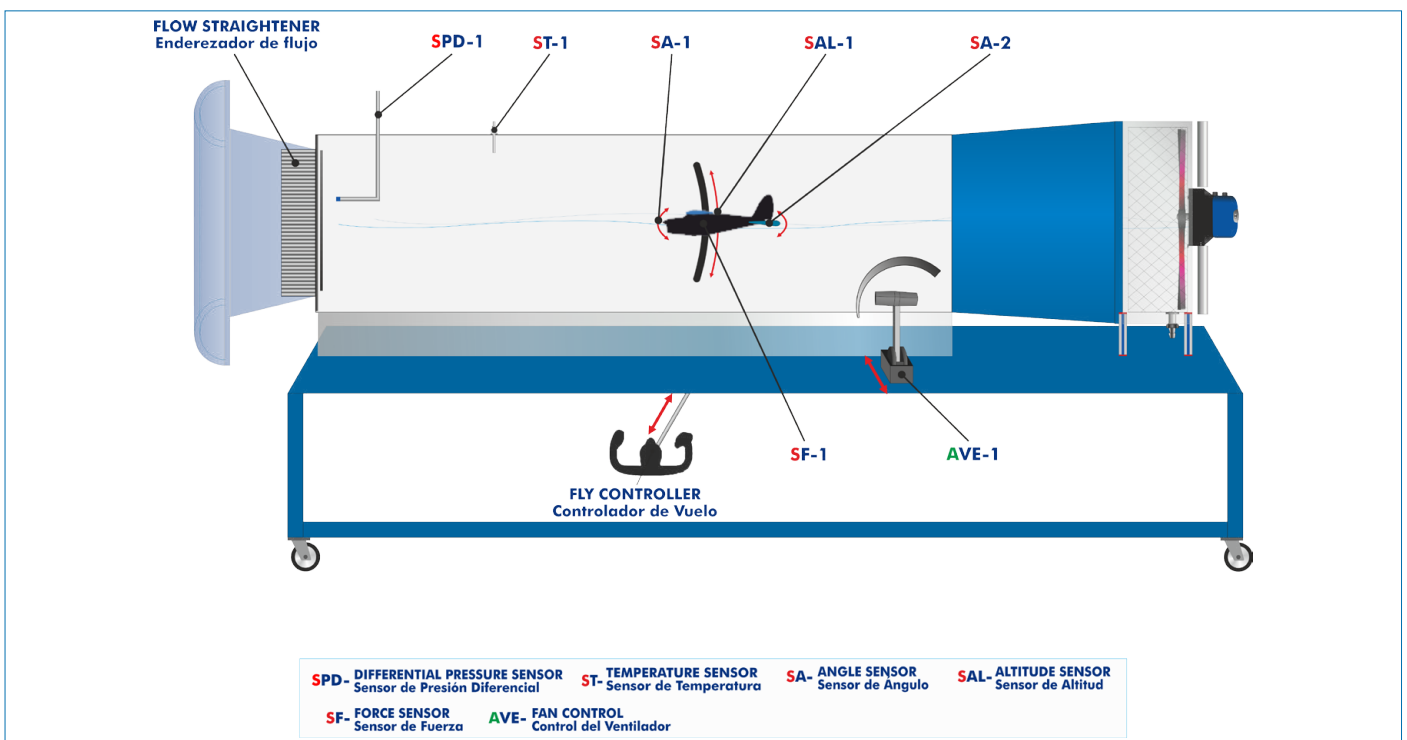
TADV225/450

www.edibon.com
 ↳ PRODUCTS
 ↳ 8.- FLUID MECHANICS



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)



"Worlddidac Quality Charter" and Platinum Member of Worlddidac

INTRODUCTION

Aerodynamics is the part of fluid mechanics that studies the motion of gases and the forces or reactions to which the bodies they interact with are subjected. Aerodynamics is not only important by itself but also as a complement to aeronautics.

According to Mach number, or relative speed of a movable object with respect to air, these studies are divided into subsonic and supersonic aerodynamics, depending on whether that number is higher or lower than one. Knowing the aerodynamics principles is useful for many activities, from the take-off and piloting of an airplane to driving a car or kicking a ball.

Every time we move or throw an object, there are many physical principles acting, but we do not notice them. A wind tunnel is a place widely used to determine the action of wind on different types of bodies. The model under study remains motionless, whereas air moves to generate the desired flow.

GENERAL DESCRIPTION

The Aerodynamic Tunnel for Flight Demonstration, "TADV225/450", consists of an open wind tunnel in whose working section the model of an aircraft with fixed wings is located. The aircraft is piloted by the user using controls similar to those of a light plane for a realistic simulation of the different flight stages. The different sensors and the extensive control possibilities allow studying the different states of flight, from take-off and landing to level flight, cruise and stall, and the influence of the control surfaces.

In the working section, an aircraft model with two propellers in the front and two wings with a commercial aerodynamic profile is suspended. By means of a manual control system it is possible to control the pitch of the aircraft and an throttle similar to that found in a real aircraft allows to control the wind speed in the working section simulating the acceleration or braking of the aircraft. To guarantee a correct control, the working section is perfectly illuminated and has a wide transparent window to visualize correctly all the process. The sensors located in the working section allow to know the pressure and the air speed, in addition, pitch angle and attitude can be measured by an angle sensor, altitude by a displacement sensor and lift force by a load cell. These values are shown on a display visible to the user while operating the controls.

The air is supplied from an axial fan placed downstream of the working section. In addition, the air passes through a flow straightener before entering the tunnel.

The throttle regulates the rotation speed of the fan allowing to accelerate and reduce the wind speed in the working section.

The plane angle controller allows to vary the pitch angle of the aircraft regulating the ascent or descent of the aircraft. This angle is shown on the display mentioned above. If this angle exceeds a certain limit, the aircraft will stall, drastically reducing the lift force on the aircraft. A locking system on the lever allows to fix a certain position.

The wings of the aircraft follow a NACA-type aerodynamic profile and include several strips on their surface which do not affect the flight of the aircraft but allow the air flow over the wing to be observed. In this way it is possible to visualize the detachment of the boundary layer and the effect of the stall.

Finally, it is possible to vary the weight of the aircraft by means of a set of weights. Moreover, it is possible to vary the center of gravity of the aircraft by placing the weights in different positions.

The possibility of varying the pitch of the aircraft and the measurement of the lift force allows to find the lift curve of the profile used and to find the value of the angle of attack for which the stall is produced.

For the Aerodynamic Tunnel for Flight Demonstration, "TADV225/450", there are a number of additional recommended elements (not included) including: Two-Pen Chart Recorder, "TADV225/450-CR", to demonstrate phugoid movement and display small oscillations, and Smoke Generator, "TADV225/450-SGI", to visualize the air flow in the aircraft's zone of influence.

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.
Open circuit wind tunnel with subsonic flow for aircraft flight simulation.
Flow straightener at the tunnel entrance.
Working area with transparent window for process visualization:
Section of the working area: 450 x 225 mm.
Additional lighting for optimal visualization.



TADV225/450 detail

Axial fan:
Power: 1.5 kW.
Air speed in the working section: 0 – 21 m/s.
Manual wind speed regulation by means of a three-phase inverter.

Aircraft:
Model suspended in the working section.
Fixed main wing, pivoting tail and two-bladed propeller.
Length: 450 mm.
Wing span: 220 mm.
Effective weight: minimum 5 N.
Two interchangeable aerodynamic profiles of the wings:
NACA 2412.
NACA 0015.
Observation of the flow turbulence thanks to wires placed on the surface of the wings.
Center of gravity and weight of the craft adjustable.

Regulation system:
Throttle that regulates the wind speed in the working section.
Plane angle controller lever to regulate the pitch angle of the aircraft.

Sensors and instrumentation:
Wind speed and pressure gauge.
Load cell to measure the lift force.
Angle sensor to measure the pitch and attitude of the aircraft.
Displacement sensor to measure altitude.
Display of the measured variables visible by the user while operating the controls.

Included elements:
Guide for a chart recorder.
Additional set of keys for the electrical cabinet.
Spare cable for the load cell.

Operating 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: 84 dB.

Electronic console with data visualization 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.

Additional recommended elements (Not included):

- TADV225/450-CR. Two-Pen Chart Recorder.
- TADV225/450-SGI. Smoke Generator.

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Study of the take-off and landing process.
- 2.- Study of the influence of the angle of attack and the speed of the aircraft on take-off.
- 3.- Influence of speed on level flight.
- 4.- Study the influence of speed on stall.
- 5.- Obtaining the relationship between lift force and angle of attack for a fixed speed. Calculation of the angle for which maximum lift is obtained and the angle for which stall is entered.
- 6.- Comparison of the experimental and theoretical lift curve (C_L vs. Alpha).
- Other practical possibilities:
 - 7.- Obtaining the relationship between the lifting force and the speed for a fixed angle of attack.
 - 8.- Influence of the position of the center of gravity on the other parameters.
 - 9.- Determination of the neutral point.
 - 10.-Determination of fugoid movement of an aircraft (TADV225/450-CR).
 - 11.-Visualization of the flow in the aircraft's zone of influence (TADV225/450-SGI).

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

TADV225/450:

Unit:

- Dimensions: 2300 x 1000 x 1600 mm approx.
(90.55 x 39.36 x 62.99 inches approx.)
- Weight: 260 kg approx.
(573 pounds approx.)

Electronic console:

- Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.20 inches approx.)
- Weight: 10 Kg approx.
(22 pounds approx.)

ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- TADV225/450-CR. Two-Pen Chart Recorder.
- TADV225/450-SGI. Smoke Generator.

SIMILAR UNITS AVAILABLE

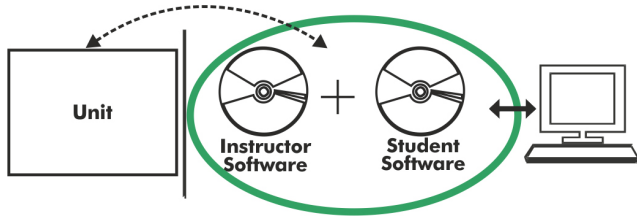
Offered in this catalog:

- TADV225/450. Aerodynamic Tunnel for Flight Demonstration.

Offered in other catalogs:

- TAVF180/100. Flow Visualization Aerodynamic Tunnel.
- 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.

TADV225/450/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.

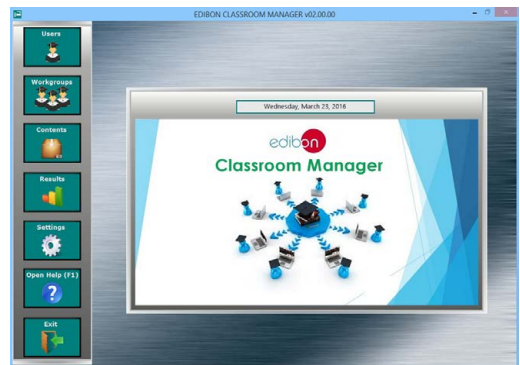
Instructor Software

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

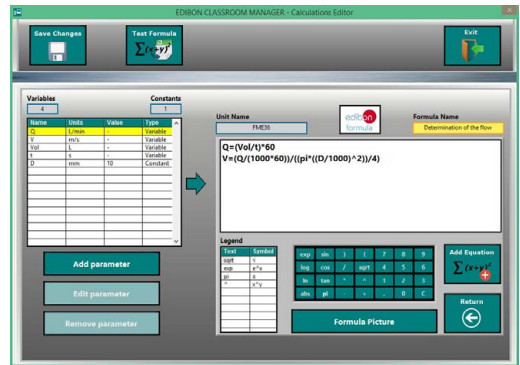
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

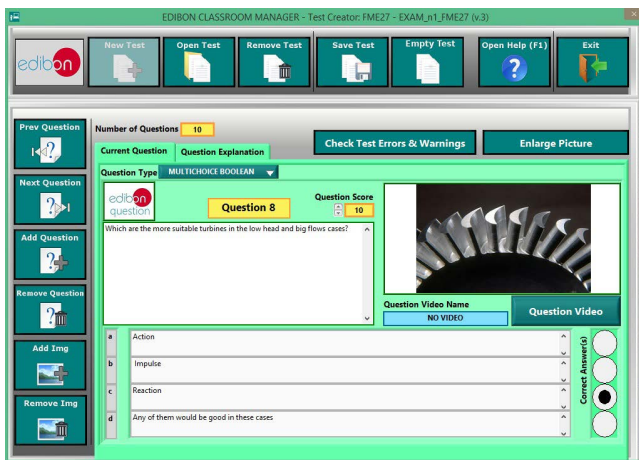
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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

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.

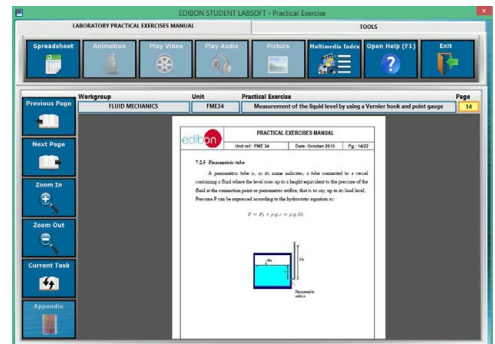
Innovative features:

- 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.

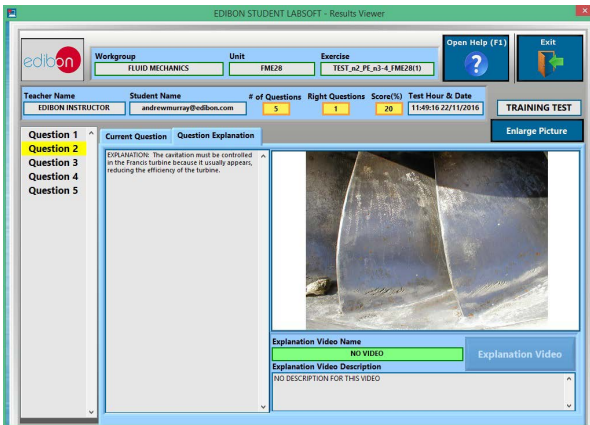
For more information see ICAI catalogue. Click on the following link:
www.edibon.com/en/interactive-computer-aided-instruction-software



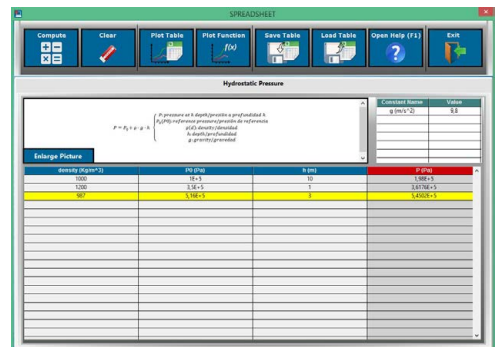
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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.



C/ Julio Cervera, 10-12-14. Móstoles Tecnológico.
28935 MÓSTOLES. (Madrid). ESPAÑA - SPAIN.
Tel.: 34-91-6199363 Fax: 34-91-6198647
E-mail: edibon@edibon.com Web: www.edibon.com

Edition: ED01/22
Date: November/2022

REPRESENTATIVE:

