edibon

Engineering and Technical Teaching Equipment

Aerodynamic Tunnel, 300 x 300 mm

TA300/300

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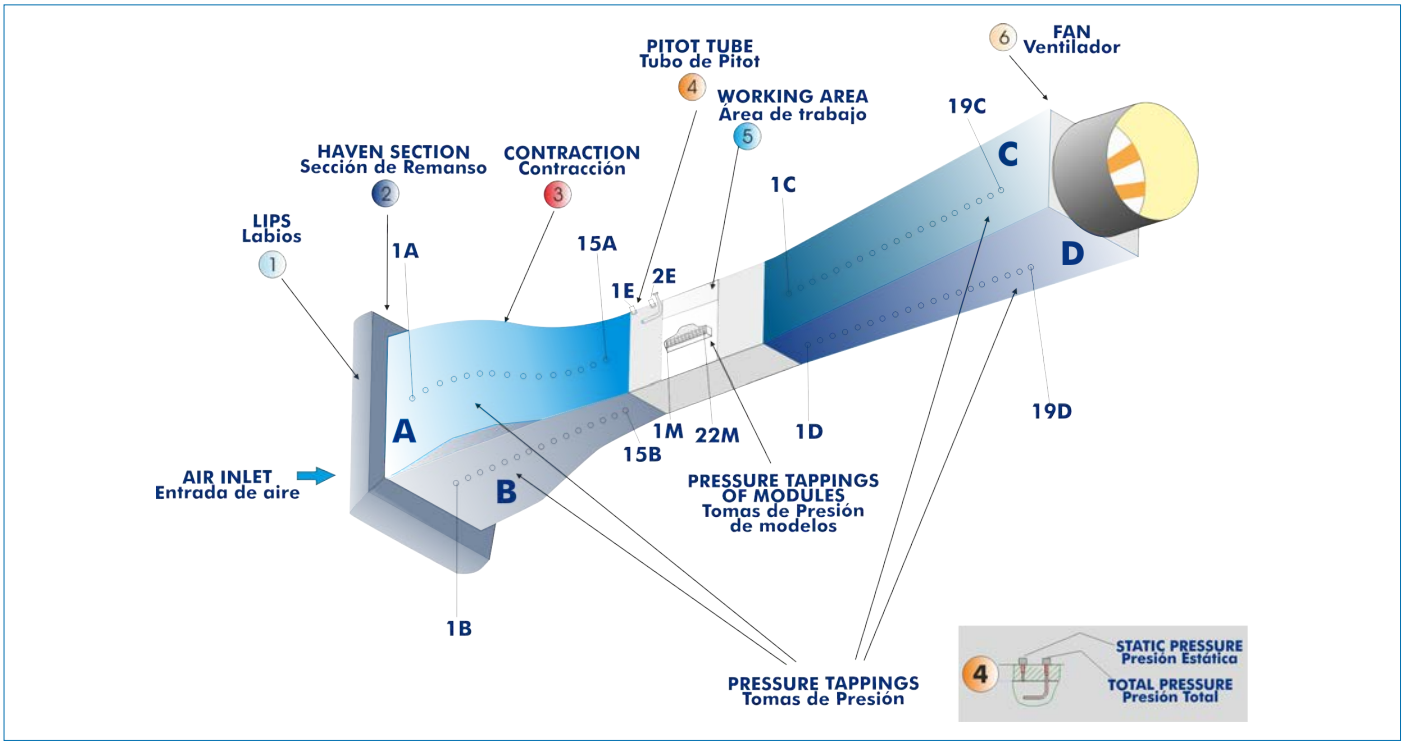
↳PRODUCTS
↳80.- FLUID MECHANICS

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, 300 x 300 mm, "TA300/300", is a wind tunnel designed to study subsonic aerodynamics in a tunnel in open circuit and with incompressible subsonic flow. Air is drawn by a variable speed fan located at the discharge end of the tunnel. Several models and accessories are available, allowing a comprehensive study of subsonic aerodynamics.

The unit includes several tunnel sections. In the same order in which the flow crosses them, they are: lips, haven section, contraction, working area, diffuser and fan.

Lips and a haven section are incorporated at the tunnel inlet to reduce the pressure drop and the interferences in the flow. An 9.5:1 contraction ratio and a perfectly studied contour curve of the contraction ensures well developed airflow through the working area.

The working area is located after the contraction. It is a constant section tract, where the models to be tested are assembled, and the dimensions of the transverse section is bigger than the models. It is made of PMMA to allow to observe the models. This section includes a Pitot static tube in the top side to study the static pressure, dynamic pressure and total pressure.

A diffuser is included at the tunnel outlet to avoid the generation of turbulences, which can generate damages in the current quality at the working area.

An axial-flow fan, located at the discharge end of the tunnel, provides a more uniform velocity profile at the working area. An electronic console contains the controller for the axial fan.

There are sixty different appropriate tappings for the pressure takings (along the tunnel and in the different models). The unit includes a twenty tube water manometer to measure the static pressure.

The models are mounted on a circular hatch, and they are coupled to the working area to seal the opening. They are secured by knobs on the side wall of the working area.

SPECIFICATIONS

Bench-top wind tunnel in open circuit and with incompressible subsonic flow.

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.

Inlet section with lips, a haven section and a 9.5:1 contraction ratio.

Transparent working area of 300 x 300 mm and length of 600 mm to assemble and test the different models.

The working area includes a Pitot static tube mounted in the top side.

Outlet section with diffuser that allows to avoid the generation of turbulences, which can generate damages the current quality in the working area.

Variable speed axial-flow fan:

Air velocity in the working area: 0 – 34 m/s.

An electronic console contains the controller for the axial fan.

Sixty different pressure tappings (along the tunnel and in the models).

Water multi-manometer:

Anodized aluminum structure.

30º inclination approx.

Twenty manometric tubes. Tubes inner diameter: 8 mm, to avoid bubbles.

Water tank for filling.

Drain valve.

Millimeter precision rules.

Several models and accessories are available, allowing a comprehensive study of subsonic aerodynamics. All these models include several pressure tappings.

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

Optional Models and Accessories: (Not included)

- TA1/300. Sphere Drag Model (requires the model TA300/300C-TARC).
- TA2/300. Drag Model of Hemisphere Convex to Airflow (requires the model TA300/300C-TARC).
- TA3/300. Circular Plate Drag Model (requires the model TA300/300C-TARC).
- TA4/300. Ring Drag Model (requires the model TA300/300C-TARC).
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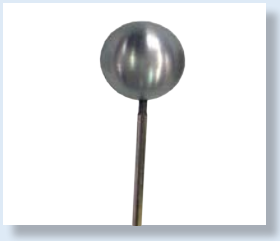
- TA7/300. Streamlined Shape Drag Model (requires the model TA300/300C-TARC).
- TA8/300. Paraboloid Drag Model (requires the model TA300/300C-TARC).
- TA9/300. Drag Model of Hemisphere Concave to Airflow (requires the model TA300/300C-TARC).
- TA10/300. Wing with Flaps Drag Model (requires the model TA300/300C-TARC).
- TA11/300. Flag Drag Model (requires the model TA300/300C-TARC).
- TA12/300. Wing Model with NACA 0015 Profile (requires the model TA300/300C-TARC).
- TA13/300. Wing Model with NACA 54118 Profile (requires the model TA300/300C-TARC).
- TA14/300. Wing Model with NACA 4415 Profile (requires the model TA300/300C-TARC).
- TA15/300. Dimpled Sphere Drag Model (requires the model TA300/300C-TARC).
- TA16/300. Set for Alternative Models Projects.
- TA17/300. Pitot Tube.
- TA18/300. Wake Survey Rake.
- TA19/300. Pressure Distribution in a Wing Model with NACA 0015 Profile.
- TA20/300. Pressure Distribution in a Wing Model with NACA 54118 Profile.
- TA21/300. Pressure Distribution in a Wing Model with NACA 4415 Profile.
- TA22/300. Pressure Distribution in a Cylinder.
- TA23/300. Bernoulli Apparatus Model.
- TA24/300. Spring-mounted Wing Model.
- TA300/A320. AIRBUS A-320 Airplane Model.
- TA300/A380. AIRBUS A-380 Airplane Model.
- TA300/B737. BOING 737 Airplane Model.
- TA300/BBA36. BEECH BONANZA A-36 Airplane Model.
- TA300/BBV35. BEECH BONANZA V-35 Airplane Model.
- TA300/F16. F-16 Airplane Model.
- TA300/MP. Accesory for Models Positioning (requires at least an airplane model).
- TA300/300C-TARC. Force Measurement Interface and Sensors (requires at least a drag model).
- TA300/300-BLE. Model to Study the Boundary Layer in a Flat Plate.
- TA300/300-SGI. Smoke Generator.
- TA300/MB. Manometers Board. 24 Manometric Tubes.
- TA300/SC. Storage Cabinet.
- TA300/YP. Yaw Probe.
- APIV. Accessory for Particle Image Velocimetry (PIV).

Examples of some models:



TA1/300. Sphere Drag Model

TA3/300. Circular Plate Drag Model

TA7/300. Streamlined Shape Drag Model

TA9/300. Drag Model of Hemisphere Concave to Airflow

TA300/300-SGI. Smoke Generator

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Comprehensive study of subsonic aerodynamics and airflow studies.

2.- Study of flow visualization.

3.- Study of static pressure, dynamic pressure and total pressure using a Pitot' tube.

4.- Study of velocity measurement using a Pitot tube.

5.- Flux in a nozzle: Determination of the characteristics of the pressures field in a nozzle.

6.- Flux in a nozzle: Observation of the local characteristics, depending on whether the walls have a curvature or not, as well as what happens at the inlet and outlet areas of the contraction.

Additional practical possibilities:

7.- Sensors calibration.

Additional practical possibilities to be done with the Optional Models and Accessories: (Not included)

8.- Display of flows around different drag models:

- Sphere Drag Model (TA1/300).
- Drag Model of Hemisphere Convex to Airflow (TA2/300).
- Circular Plate Drag Model (TA3/300).
- Ring Drag Model (TA4/300).
- Square Plate Drag Model (TA5/300).
- Cylinder Drag Model (TA6/300).
- Streamlined Shape Drag Model (TA7/300).
- Paraboloid Drag Model (TA8/300).
- Drag Model of Hemisphere Concave to Airflow (TA9/300).
- Wing with Flaps Drag Model (TA10/300).
- Flag Drag Model (TA11/300).
- Wing Model with NACA 0015 Profile (TA12/300).
- Wing Model with NACA 54118 Profile (TA13/300).
- Wing Model with NACA 4415 Profile (TA14/300).
- Dimpled Sphere Drag Model (TA15/300).

9.- Determination of the drag coefficient and the lift coefficient in different models:

- Sphere Drag Model (TA1/300).
- Drag Model of Hemisphere Convex to Airflow (TA2/300).
- Circular Plate Drag Model (TA3/300).
- Ring Drag Model (TA4/300).
- Square Plate Drag Model (TA5/300).
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10.-Measurement of drag forces and lift forces in different models:

- Sphere Drag Model (TA1/300).
- Drag Model of Hemisphere Convex to Airflow (TA2/300).
- Circular Plate Drag Model (TA3/300).
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- Wing Model with NACA 54118 Profile (TA13/300).
- Wing Model with NACA 4415 Profile (TA14/300).
- Dimpled Sphere Drag Model (TA15/300).

11.-Study of pressure and flow distribution around a model:

- Pressure Distribution in a Wing Model with NACA 0015 Profile (TA19/300).
- Pressure Distribution in a Wing Model with NACA 54118 Profile (TA20/300).
- Pressure Distribution in a Wing Model with NACA 4415 Profile (TA21/300).
- Pressure Distribution in a Cylinder (TA22/300).

12.-Study of effect of changing in Bernoulli Apparatus Model (TA23/300) the cross section and application of the Bernoulli equation.

13.-Investigation into the influence of models shape in the drag forces (Drag Models and Force Measurement Console and Sensors (TA300/300-TAR)).

14.-Study of static pressure, dynamic pressure and total pressure using a Pitot tube (TA17/300).

15.-Study od Boundary Layer in a Flat Plate (TA300/300-BLE).

16.-Demonstration of flow patterns around different objects with the Smoke Generator (TA300/300-SG1).

17.-Study of static pressure, dynamic pressure and total pressure with the Wake Survey Rake (TA18/300).

18.-Study of fluter (TA24/300).

19.-Study of the Accessory for Particle Image Velocimetry (APIV).

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

TA300/300:

-Dimensions: 2720 x 900 x 700 mm approx.
(107.08 x 35.43 x 27.56 inches approx.)

-Weight: 220 Kg approx.
(485 pounds approx.)

OPTIONAL MODELS AND ACCESSORIES (Not included)

- TA1/300. Sphere Drag Model (requires the model TA300/300C-TARC).
- TA2/300. Drag Model of Hemisphere Convex to Airflow (requires the model TA300/300C-TARC).
- TA3/300. Circular Plate Drag Model (requires the model TA300/300C-TARC).
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- TA300/MB. Manometers Board. 24 Manometric Tubes.
- TA300/SC. Storage Cabinet.
- TA300/YP. Yaw Probe.
- APIV. Accessory for Particle Image Velocimetry (PIV).

AVAILABLE VERSIONS

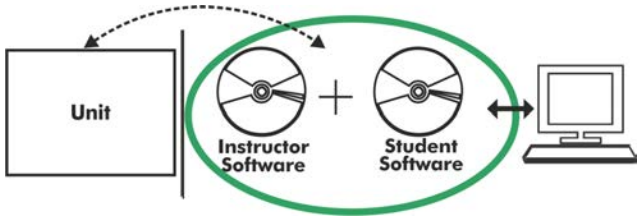
Offered in this catalog:

- TA300/300. Aerodynamic Tunnel, 300 x 300 mm.

Offered in other catalog:

- TA300/300C. Computer Controlled Aerodynamic Tunnel, 300 x 300 mm.

TA300/300/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

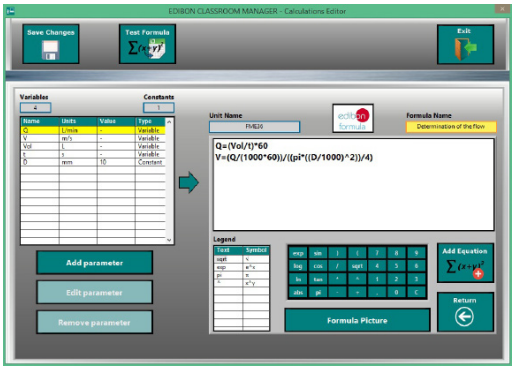
- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

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.

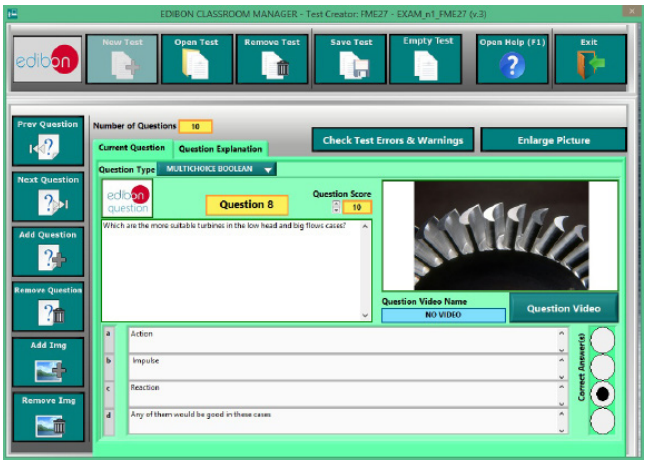
Innovative features:

- **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.**

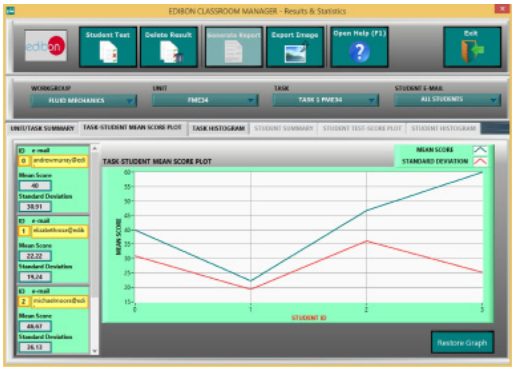
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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.

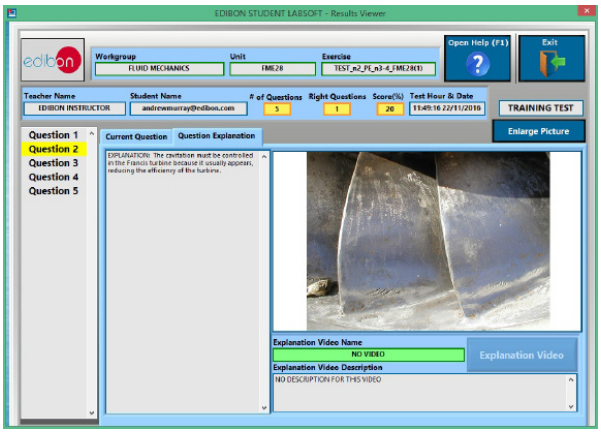
Innovative features:

- **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.**

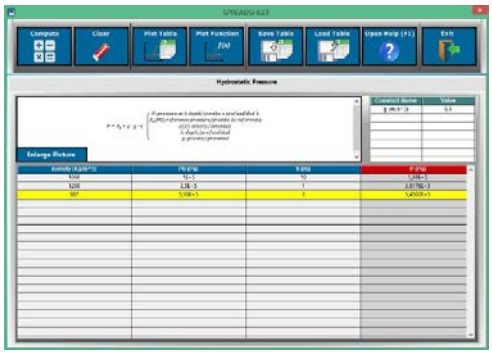
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen

EPE. EDIBON Practical Exercise Program Package Main Screen

For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/files/expansion/ICAI/catalog



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.

INTERNATIONAL

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REPRESENTATIVE: