

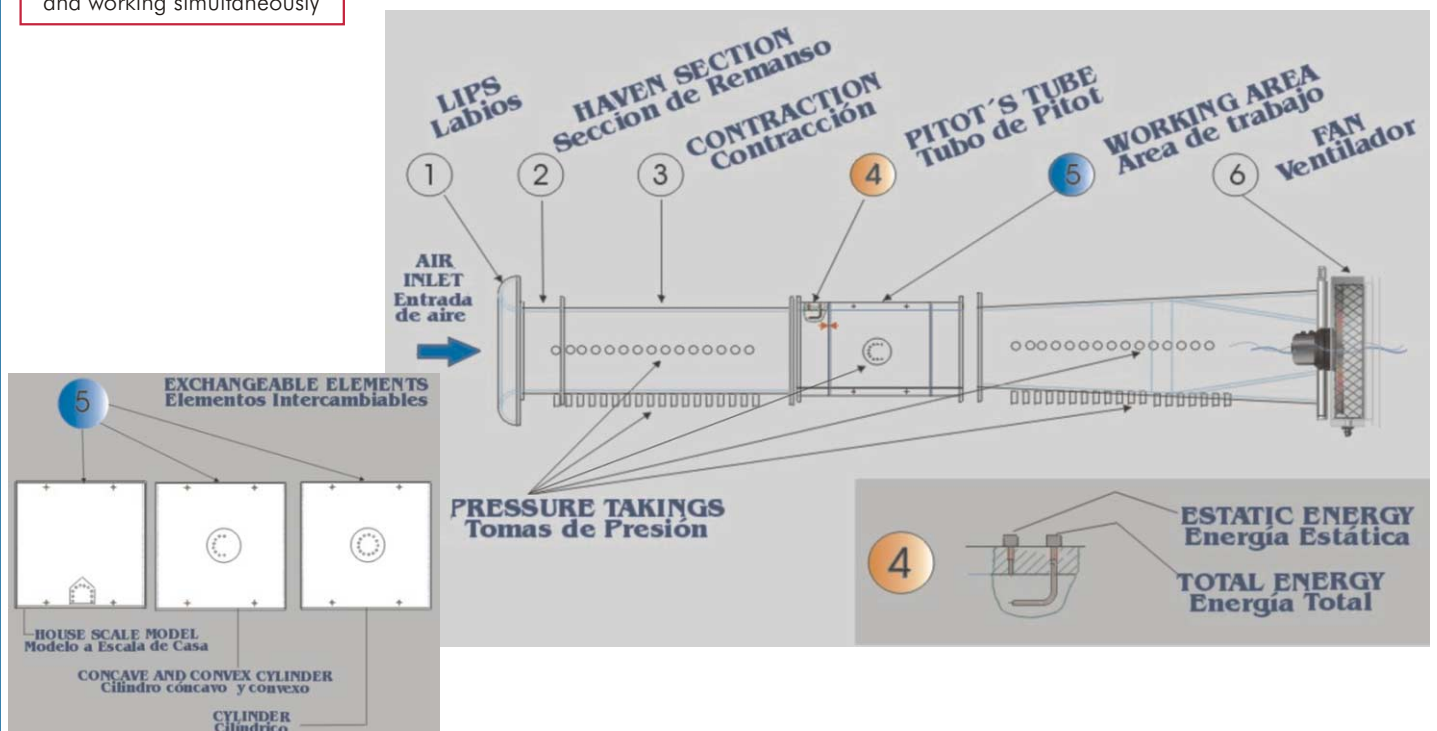
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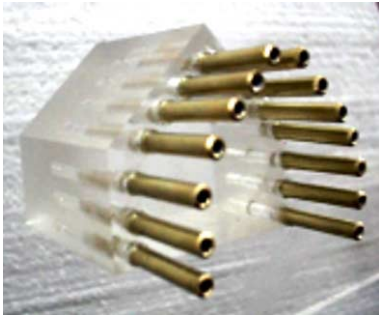
Products
Products range
Units
8.-Fluid Mechanics & Aerodynamics

PROCESS DIAGRAM AND ELEMENTS ALLOCATION

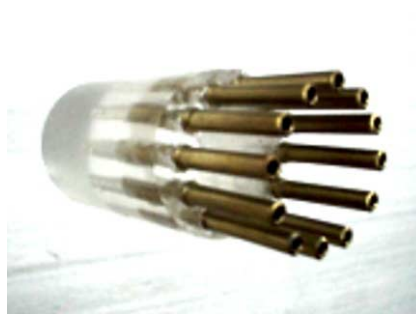
1 actuator and 30 sensors
(90 different pressure takings)
controlled from any computer,
and working simultaneously

**OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL**





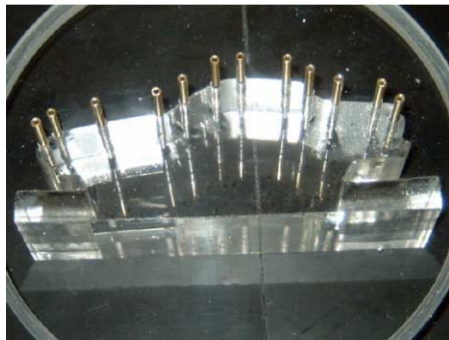
TA1C. House scale model



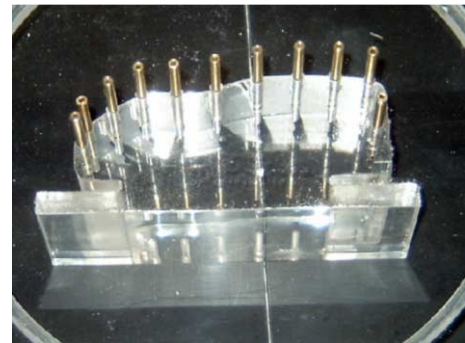
TA2C. Cylinder model



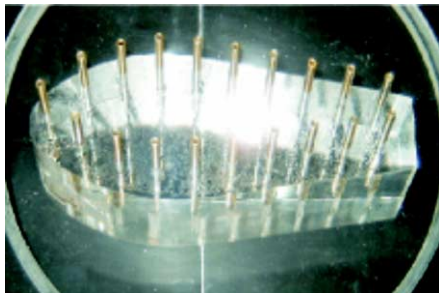
TA3C. Convex semi-cylinder model



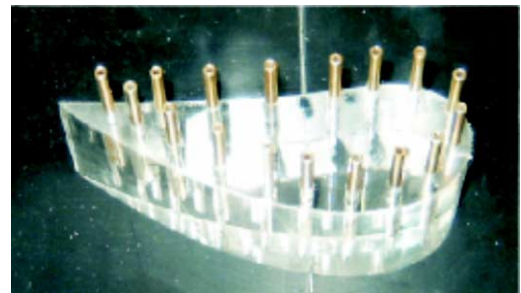
TA4C. Car model



TA8C. Train model



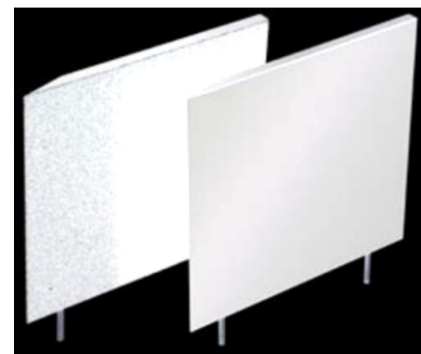
TA9C. Projectile model



TA11C. Wing of a plane model



TA14C. Bernoulli Apparatus model



TA15C. Boundary Layer Plate model

Other available models:

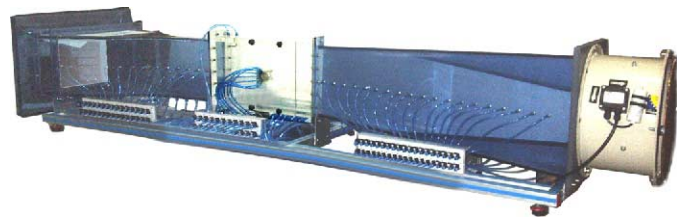
- TA5C. Lorry model.
- TA6C. Lorry with wind deflector model.
- TA7C. Plane model.
- TA12C. Concave semi-cylinder model
- TA13C. Blunt Element model.

Items supplied as standard

① TA50-250C. Unit:

Anodized aluminium structure. Main metallic elements in stainless steel.
 Diagram in the front panel with similar distribution that the elements in the real unit.
 Small, benchtop wind tunnel of open circuit and subsonic flux.
 Transparent working area for visibility of 50 x 250 mm, including the removable panel to place a wide range of aerodynamics models.
 30 pressure sensors for 90 different pressure takings (along the tunnel and in the models).
 Pitot's tube.
 Variable speed fan, computer controlled.
 Models included in the standard supply:

- TA1C. House scale model.
- TA2C. Cylinder model.
- TA3C. Convex semi-cylinder model.



TA50-250C. Unit

OPTIONAL models:

- TA4C. Car model.
- TA5C. Lorry model.
- TA6C. Lorry with wind deflector model.
- TA7C. Plane model.
- TA8C. Train model.
- TA9C. Projectile model.
- TA11C. Wing of a Plane model.
- TA12C. Concave semi-cylinder model.
- TA13C. Blunt Element model.
- TA14C. Bernoulli Apparatus model.
- TA15C. Boundary Layer Plate model.

Models included in the standard supply:



TA1C



TA2C



TA3C

② TA50-250C/CIB. Control Interface Box

Control interface box with process diagram in the front panel and with the same distribution that the different elements located in the unit, for an easy understanding by the student.
 All sensors, with their respective signals, are properly manipulated for -10V. to +10V computer output.
 Sensors connectors in the interface have different pins numbers (from 2 to 16), to avoid connection errors.
 Single cable between the control interface box and computer.
 The unit control elements are permanently computer controlled, without necessity of changes or connections during the whole process test procedure.
 Simultaneously visualization in the computer of all parameters involved in the process.
 Calibration of all sensors involved in the process.
 Storage of all the process data and results in a file.
 Graphic representation, in real time, of all the process/system responses.
 All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.
 All the actuators and sensors values and their responses are placed in only one computer screen.
 Shield and filtered signals to avoid external interferences.
 Real time computer control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process.
 Real time computer control for pumps, compressors, resistances, control valves, etc.
 Open control allowing modifications, at any time and in a real time, of parameters involved in the process simultaneously.
 Three safety levels, one mechanical in the unit, other electronic in control interface and the third one in the control software.



TA50-250C/CIB

③ DAB. Data Acquisition Board:

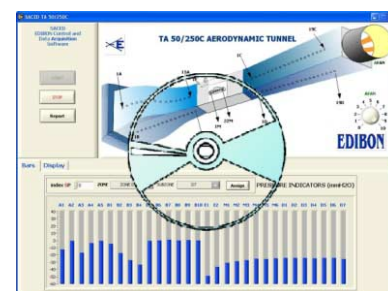
PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
Analog input:
 Number of channels= 16 single-ended or 8 differential. Resolution= 16 bits, 1 in 65536.
 Sampling rate up to: 250 KS/s (Kilo samples per second).
 Input range (V)=±10V.
 Data transfers=DMA, interrupts, programmed I/O. Number of DMA channels=6.
Analog output:
 Number of channels=2. Resolution= 16 bits, 1 in 65536.
 Maximum output rate up to: 833 KS/s.
 Output range(V)=±10V.
 Data transfers=DMA, interrupts, programmed I/O.
Digital Input/Output:
 Number of channels=24 inputs/outputs. D0 or DI Sample Clock frequency: 0 to 1 MHz.
 Timing:
 Counter/timers=2. Resolution: Counter/timers: 32 bits.



DAB

④ TA50-250C/CCSOF. Computer Control + Data Acquisition + Data Management Software:

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen. Compatible with the industry standards.
 Registration and visualization of all process variables in an automatic and simultaneously way.
 Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.
 Management, processing, comparison and storage of data.
 Sampling velocity up to 250,000 data per second guaranteed.
 Student calibration system for all sensors involved in the process.
 It allows the registration of the alarms state and the graphic representation in real time.
 Comparative analysis of the obtained data, after to the process and modification of the conditions during the process.
 Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access at different work levels.
 This unit allows that the 30 students of the classroom can visualize simultaneously all results and manipulation of the unit, during the process, by using a projector.



TA50-250C/CCSOF

⑤ Cables and Accessories.

⑥ Manuals:

This unit is supplied with 8 manuals: Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

*References 1 to 6: TA50-250C + TA50-250C/CIB + DAB + TA50-250C/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.

Continue...

Complementary items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PLC-PI. PLC Module:

Circuit diagram in the front panel.

Front panel:

Digital inputs(X) and Digital outputs (Y) block:

16 Digital inputs, activated by switches and 16 LEDs for confirmation (red).

14 Digital outputs (through SCSI connector) with 14 LEDs for message (green).

Analog inputs block:

16 Analog inputs (-10V. to + 10V.) (through SCSI connector).

Analog outputs block:

4 Analog outputs (-10V. to + 10V) (through SCSI connector).

Touch screen:

High visibility and multiple functions.

Display of a highly visible status.

Recipe function.

Bar graph function.

Flow display function.

Alarm list.

Multi language function.

True type fonts.

Back panel:

Power supply connector.

Fuse 2A.

RS-232 connector to PC.

Inside:

Power supply outputs: 24 Vdc, 12 Vdc, -12 Vdc, 12 Vdc variable.

Panasonic PLC:

High-speed scan of 0.32 μ sec. for a basic instruction.

Program capacity of 32 Ksteps, with a sufficient comment area.

Free input AC voltage(100 to 240 VAC).

DC input: 16 (24 V DC).

Relay output: 14 (250 VA AC/2 A).

High-speed counter.

Multi-point PID control.

Digital inputs/outputs and analog inputs/outputs Panasonic modules.

Communication RS232 wire, to computer (PC).



PLC-PI

⑧ TA50-250/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

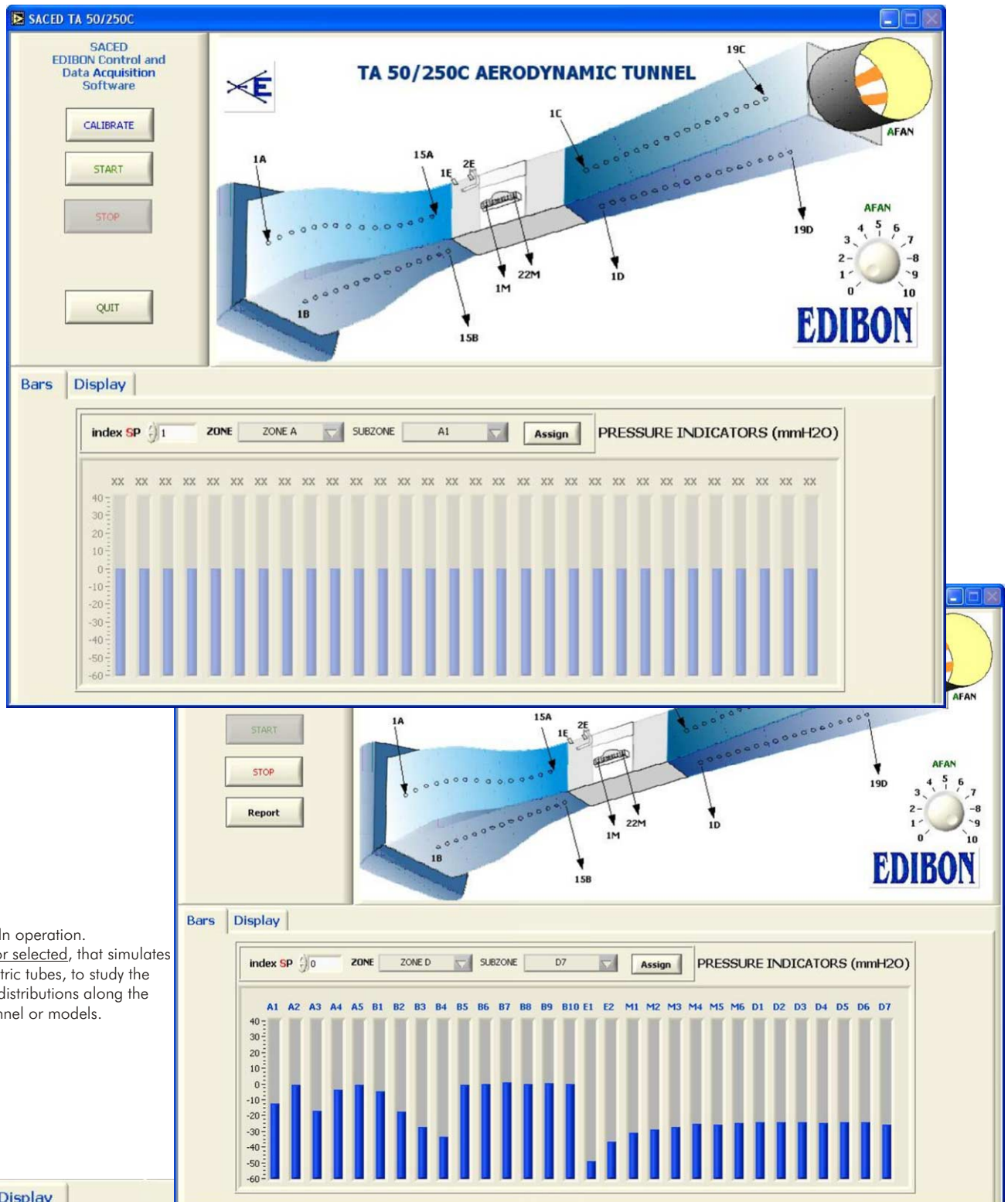
Items available on request

⑨ TA50-250C/CAL. Computer Aided Learning Software (Results Calculation and Analysis).

⑩ TA50-250C/FSS. Faults Simulation System.

Software Main Screens

Main screen



In operation.
 Bars indicator selected, that simulates
 manometric tubes, to study the
 pressure distributions along the
 tunnel or models.

SPD-1	-8,0	mmH2O	SPD-11	-0,2	mmH2O	SPD-21	-15,3	mmH2O
SPD-2	-0,5	mmH2O	SPD-12	1,0	mmH2O	SPD-22	-16,2	mmH2O
SPD-3	-10,3	mmH2O	SPD-13	-0,4	mmH2O	SPD-23	-15,3	mmH2O
SPD-4	-2,2	mmH2O	SPD-14	0,2	mmH2O	SPD-24	-14,9	mmH2O
SPD-5	-0,3	mmH2O	SPD-15	-0,2	mmH2O	SPD-25	-15,2	mmH2O
SPD-6	-2,7	mmH2O	SPD-16	-29,9	mmH2O	SPD-26	-15,0	mmH2O
SPD-7	-10,8	mmH2O	SPD-17	-22,7	mmH2O	SPD-27	-15,8	mmH2O
SPD-8	-16,7	mmH2O	SPD-18	-18,6	mmH2O	SPD-28	-15,1	mmH2O
SPD-9	-20,4	mmH2O	SPD-19	-18,0	mmH2O	SPD-29	-15,2	mmH2O
SPD-10	-0,7	mmH2O	SPD-20	-16,9	mmH2O	SPD-30	-16,5	mmH2O

In operation.
 Sensors display.

Software Main Screens (continuation)

Calibration, Control and Advanced Applications screens

NIWriteCal.vi

Restore Factory Settings

Analog Input Channel: SP-1

Sensor Name: SP-1

Least Squares Fit

Gain: 1 Offset: 0

PTA: 10

Volts: -0,00025 Calibrated: -0,00025

ENTER DONE

ACTUATORS

AFAN

0 1 2 3 4 5 6 7 8 9 10

0

Dev1/ai0

Example of
Sensors Calibration screens

Simultaneous Calibration

Reference Value: 0

Data taken: 0

Reference Select	Sensors	Volts	Calibrated	ΔT
<input type="checkbox"/>	ST-1	0.2753	28.8346	28.83
<input type="checkbox"/>	ST-2	0.3335	29.7856	29.79
<input type="checkbox"/>	ST-3	0.331	29.0641	29.06
<input type="checkbox"/>	ST-4	0.3254	29.5453	29.55
<input type="checkbox"/>	ST-5	0.3295	29.4276	29.43
<input type="checkbox"/>	ST-6	0.3458	34.752	34.75
<input type="checkbox"/>		-0.0037	-0.0037	0
<input type="checkbox"/>		-0.004	-8.01826	8.02
<input type="checkbox"/>		3.4768	3.4768	3.48
<input type="checkbox"/>		3.215	291.888	291.89
<input type="checkbox"/>		3.066	3.066	3.07
<input type="checkbox"/>		2.6614	2.6614	2.66
<input type="checkbox"/>		2.4281	2.4281	2.43
<input type="checkbox"/>	SC-1	0.1291	0.1424	0.14
<input type="checkbox"/>	SC-2	0.0104	-0.0211	0.02
<input type="checkbox"/>	AN-1	5.9886	5.9886	5.99

☐ Select all

ENTER DONE

GAIN	OFFSET	r
ST-1	101.705	0.8354
ST-2	98.5001	-3.0594
ST-3	102.291	-4.7913
ST-4	102.262	-3.7268
ST-5	101.438	-3.9967
ST-6	91.5356	3.1025
	1	0
	105.08	-7.5992
	1	0
	92.6831	-6.0846
	1	0
	1	0
	1	0
SC-1	0.784847	0.0411
SC-2	0.9199	-0.0307
AN-1	1	0

EXIT SAVE & EXIT

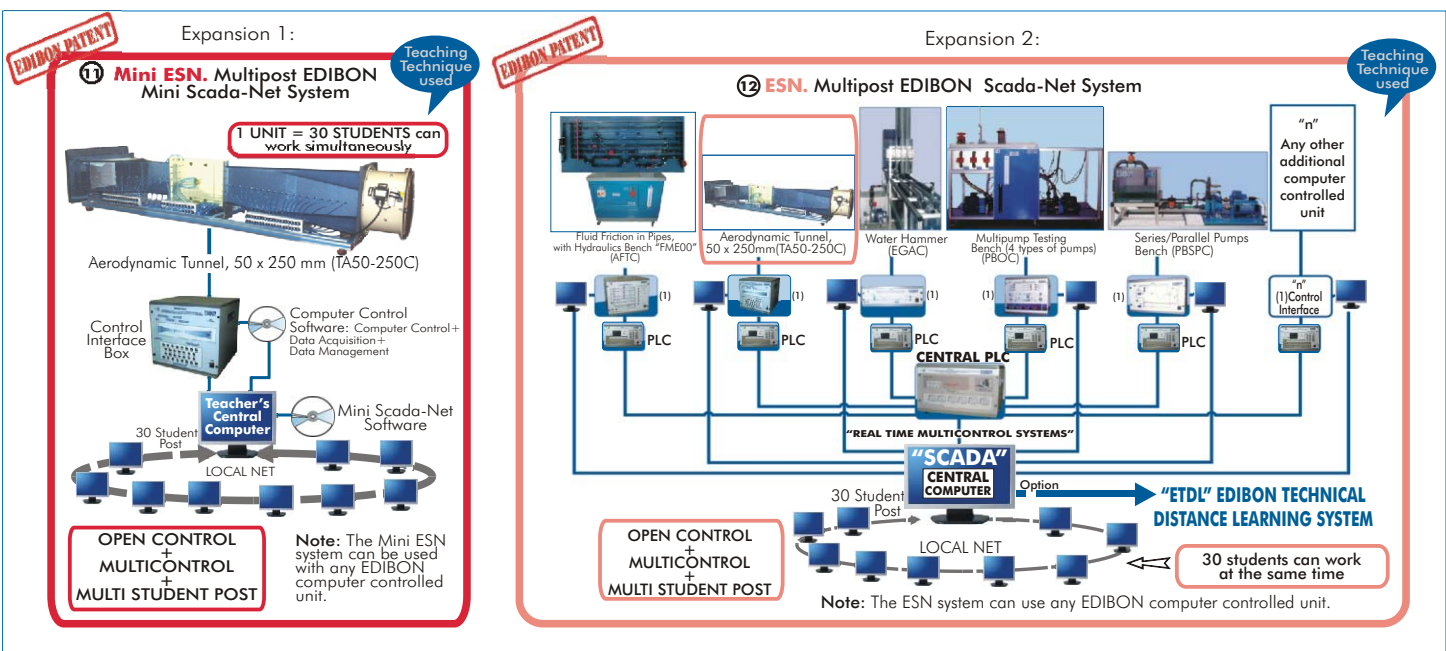
EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Comprehensive study of subsonic aerodynamics and air flow studies.
- 2.- Flux in a nozzle. Determine the characteristics of the pressures field in a nozzle.
- 3.- Flux in an nozzle. To observe the local characteristics, depending on whether the walls have a curvature or not, as well as what happens in the inlet and outlet areas of the contraction.
- 4.- Flow of an uniform current around a cylinder.
- 5.- To determine the form of the field of pressures around a cylinder on which a perpendicular to the axis current impacts.
- 6.- To determine, by the detachment type, if the boundary layer finally becomes turbulent or remains laminar.
- 7.- To determine the coefficient of resistance of the cylinder, for the described situation of flow.
- 8.- To relate all the above mentioned with the Reynolds's number.
- 9.- Flow of an uniform current around a concave and a convex semi-cylinder.
- 10.- To determine the field or pressures in the two semi-cylinders, the concave one and the convex one.
- 11.- To determine the coefficients of aerodynamic resistance in the concave and the convex semi-cylinders.
- 12.- Aerodynamics forces due to the wind on house.
- 13.- Measurement of pressure distribution around body two-dimensional.
- 14.- Flow visualization studies.
- 15.- Velocity and pressure distribution measurement using a Pitot's Tube.
- 16.- Sensors calibration.
- 18.- Visualization of all the sensors values used in the TA50-250C unit process.
- 19.- Calibration of all sensors included in the TA50-250C unit process.
- 20.- Hand on of all the actuators involved in the TA50-250C unit process.
- 21.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
- 22.- Simulation of outside actions, in the cases do not exist hardware elements. (Example: test of complementary tanks, complementary industrial environment to the process to be studied, etc).
- 23.- PLC hardware general use and manipulation.
- 24.- PLC process application for TA50-250C unit.
- 25.- PLC structure.
- 26.- PLC inputs and outputs configuration.
- 27.- PLC configuration possibilities.
- 28.- PLC program languages.
- 29.- PLC different programming standard languages (literal structured, graphic, etc.).
- 30.- New configuration and development of new process.
- 31.- Hand on an established process.
- 32.- To visualize and see the results and to make comparisons with the TA50-250C unit process.
- 33.- Possibility of creating new process in relation with the TA50-250C unit.
- 34.- PLC Programming Exercises.
- 35.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done by PLC Module (PLC-PI) + PLC Control Software:

- 17.- Control of the TA50-250C unit process through the control interface box without the computer.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



ORDER INFORMATION

[illegible]

Minimum configuration for normal operation includes: PLC. Industrial Control using PLC (7 and 8):

- ① Unit: TA50-250C. Computer Controlled Aerodynamics Tunnel, 50 x 250mm., including models TA1C, TA2C and TA3C.
 - ② TA50-250C/CIB. Control Interface Box.
 - ③ DAB. Data Acquisition Board.
 - ④ TA50-250C/CCSOF. Computer Control + Data Acquisition + Data Management Software.
 - ⑤ Cables and Accessories.
 - ⑥ Manuals.
 - ⑦ PCL-PI. PLC Module.
 - ⑧ TA50-250C/PLC-SOF. PLC Control Software.
 - ⑨ TA50-250C/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request).
 - ⑩ TA50-250C/FSS. Faults Simulation System. (Available on request).
- Expansions
- ⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System.
 - ⑫ ESN. Multipost EDIBON Scada-Net System.

* IMPORTANT: Under TA50-250C we always supply all the elements for immediate running as 1, 2, 3, 4, 5 and 6.

[illegible]

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- ② TA50-250C/CIB. Control Interface Box.
- ③ DAB. Data Acquisition Board.
- ④ TA50-250C/CCSOF. Computer Control + Data Acquisition + Data
- ⑤ PCL-PI. PLC Module.
- ⑥ TA50-250C/PLC-SOF. PLC Control Software.
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- ⑧ TA50-250C/FSS. Faults Simulation System. (Available on request).

Management Software.	Expansions
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- ⑤ Cables and Accessories.
⑥ Manuals.

REQUIRED SERVICES

- Electrical supply: single-phase, 220 V / 50 Hz. or 110 V/ 60 Hz.
- Computer (PC).

DIMENSIONS & WEIGHTS

- | | |
|------------------------|--|
| TA50-250C Unit: | -Dimensions: 2720 x 820 x 700 mm. approx.
-Weight : 200 Kg. approx. |
| Control Interface Box: | -Dimensions: 490 x 450 x 470 mm. approx.
-Weight: 20 Kg. approx. |
| PLC Module (PLC-PI): | -Dimensions: 490 x 330 x 310 mm. approx.
-Weight: 30 Kg. approx. |

OPTIONAL ACCESSORIES

Aerodynamic models:

- | | |
|---|--------------------------------------|
| -TA4C. Car model. | -TA11C. Wing of a Plane model. |
| -TA5C. Lorry model. | -TA12C. Concave semi-cylinder model. |
| -TA6C. Lorry with wind deflector model. | -TA13C. Blunt Element model. |
| -TA7C. Plane model. | -TA14C. Bernoulli Apparatus model. |
| -TA8C. Train model. | -TA15C. Boundary Layer Plate model. |
| -TA9C. Projectile model. | |

AVAILABLE VERSIONS

Offered in this catalogue:

- **TA50-250C.** Computer Controlled Aerodynamic Tunnel, 50 x 250 mm.

Offered in other catalogue:

- **TA50-250.** Aerodynamic Tunnel, 50 x 250 mm.

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

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REPRESENTATIVE: