Unit: TA50-250C. Computer Controlled Aerodynamic Tunnel, 50x250 mm

Always included in the supply:

1. Control Interface Box
2. Data Acquisition Board
3. Software for:
   - Computer Control
   - Data Acquisition
   - Data Management
4. Cables and Accessories
5. Manuals

SACED. EDIBON Computer Control System

Unitary Process Configuration

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

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Products range
Units
8.- Fluid Mechanics & Aerodynamics

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL

European Union Certificate
Certificates ISO 14001: 2004 and ECO-Management and Audit Scheme (environmental management)
Worlddidac Quality Charter Certificate
Worlddidac Member

Page 1
Available Models:

- 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.
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).
Pilot’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.

OPTIONAL models:
- TA4C. Car model.
- TA5C. Lorry model.
- TA6C. Lorry with wind deflector model.
- TA7C. Plane model.
- TA8C. Train model.
- TA9C. Projectile model.
- TA10C. Wing of a Plane model.
- TA12C. Concave semi-cylinder model
- TA13C. Blunt Element model.
- TA14C. Bernoulli Apparatus model.
- TA15C. Boundary Layer Plate model.

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 pines 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.
Simultaneous 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.

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.

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.

Cables and Accessories:

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.
### Complementary items to the standard supply

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

**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 µsec. for a basic instruction.
  - Program capacity of 32 Ksteps, with a sufficient comment area.
  - Free input AC voltage (100 to 240 V AC).
  - DC input: 16 (24 V DC).
  - Relay output: 14 (250 V A 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).

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

For this particular unit, always included with PLC supply.

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**Items available on request**

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

- **TA50-250C/FSS. Faults Simulation System.**
In operation.

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

In operation.

**Sensors display.**

Continue...
Software Main Screens (continued)

Calibration, Control and Advanced Applications screens

Example of Sensors Calibration screens

Simultaneous Calibration
Some Practical Possibilities of the Unit:

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 a 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.
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.
15. Velocity and pressure distribution measurement using a Pitot’s Tube.

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

10. To determine the coefficients of aerodynamic resistance in the concave and the convex semi-cylinders.
11. To determine the field or pressures in the two semi-cylinders, the concave one and the convex one.
12. Aerodynamics forces due to the wind on house.
15. Velocity and pressure distribution measurement using a Pitot’s Tube.

Exercises and Practical Possibilities

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

Possibilities of Other Available Expansions

Expansion 1:
- Mini ESN. Multipost EDIBON Scada-Net System
- Computer Control + Data Acquisition + Data Management Software
- Open Control Multi-Control Multi Student Post
- Note: The Mini ESN system can be used with any EDIBON computer controlled unit

Expansion 2:
- ESN. Multipost EDIBON Scada-Net System
- Note: The ESN system can be used with any EDIBON computer controlled unit

Order Information

Items supplied as standard
Minimum configuration for normal operation includes:
- Unit: TA50-250C. Computer Controlled Aerodynamics Tunnel, 50 x 250mm, including models TA1C, TA2C and TA3C.
- TA50-250C/CIB. Control Interface Box.
- DAB. Data Acquisition Board.
- TA50-250C/CCSF. Computer Control + Data Acquisition + Data Management Software.
- Cables and Accessories.
- Manuals.

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

Complementary items to the standard supply
- PLC. Industrial Control using PLC (7 and 8):
  - PCL-PI. PLC Module.
  - TA50-250C/PLC-SOF. PLC Control Software.

Expansions
- Mini ESN. Multipost EDIBON Mini Scada-Net System.
- ESN. Multipost EDIBON Scada-Net System.

Note:
- The ESN system can be used with any EDIBON computer controlled unit.

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### REQUIRED SERVICES

- Electrical supply: single-phase, 220 V / 50 Hz or 110V / 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.
  - 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.

### AVAILABLE VERSIONS

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

- **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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