



**Federal Employer
Identification
Number
27-1184917**

ESTIMATE

**Edibon-USA
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Date

Estimate #

1/10/2014

11829

Name / Address

Ship To

Florida Atlantic University
Attn: Business Office
BC-5, 710
Ft. Lauderdale, FL 33301

Florida Atlantic University
Dr. Peter Scarlatos
Civil & Envir Eng
777 Glades Road
Boca Raton, FL 33431

**Estimate for planning only.
Prices and Specifications
subject to change without
notice.**

Reference

Terms

Rep

FOB

Project

FAU-AFTC

Net 30

IL-US

Destination

Fluid Dynamics

Item

Description

Qty

Price

Total

AFTC

Computer Controlled Fluid Friction in Pipes with Hydraulics Bench (FME00)

1

27,144.00

27,144.00

CIF/Install

CIF (Shipping), Installation and Training

1,904.00

1,904.00

TERMS

- All prices are in USD ,
- Manufacturing time estimated: 75-90 Bus. Days
- Please allow 3-4 weeks transit time
- This offer is valid for 60 days,
- Payment due upon invoice
- Manufacturer: EDIBON S.A., - Origin: SPAIN
- Warranty: 3 years. Parts available 5 years.
- Customs Tarif Number: 902300.10
- Any / All Taxes are the responsibility of the customer.
- See Specs for Required Services, responsibility of customer.
- Computer-controlled Units require Desktop PCs, not included.

Specs

See attached data sheet for specifications

IL-USA

Edibon-USA, LLC is represeneted in Florida by: Innovative Links USA Inc, Mr. Iqbal Bukhari, 6504 Yellowhammer Avenue, Tampa, FL 33625
- Ph: (813) 410-7875

**This document is an ESTIMATE for planning purposes only.
An official quotation will be provided upon agreement of detail specifications and deliverables.**

Total

\$29,048.00

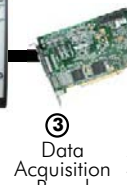


Always included in the supply:

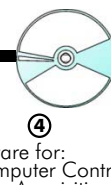
SCADA. EDIBON Computer Control System



② Control Interface Box



③ Data Acquisition Board



④ Software for:
- Computer Control
- Data Acquisition
- Data Management

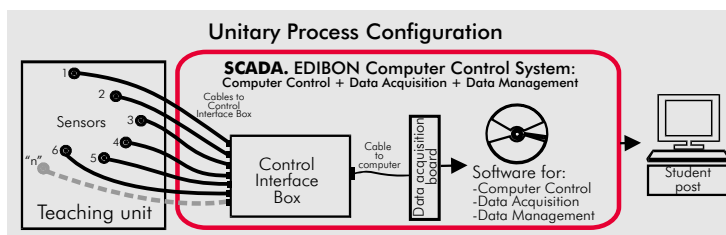
⑤ Cables and Accessories

⑥ Manuals



Computer (not included in the supply)

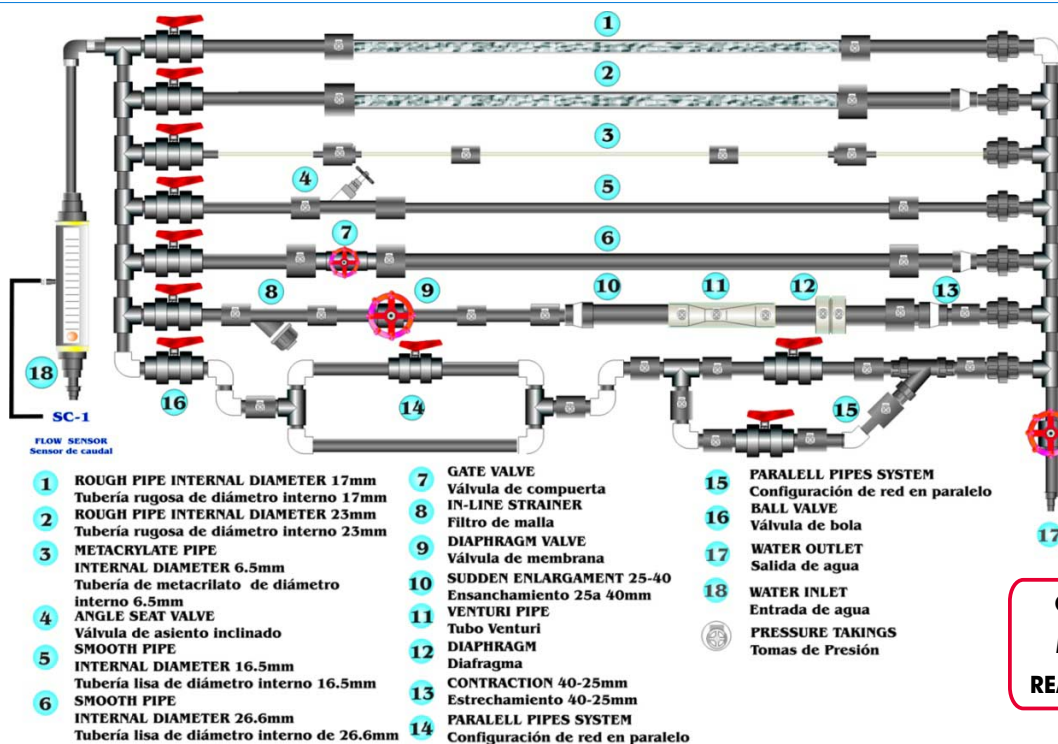
① Unit: AFTC. Fluid Friction in Pipes, with Hydraulics Bench (FME00)



www.edibon.com

Products
Products range
Units
8.-Fluid Mechanics & Aerodynamics

PROCESS DIAGRAM AND ELEMENTS ALLOCATION



OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL

SPECIFICATIONS

Items supplied as standard

① AFTC. Unit:

This unit allows the detailed study of fluid friction head losses which occur when a fluid flows through pipes, fittings and flow metering elements.
Anodized aluminium structure and panel in painted steel.
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Quick connections.
Rapidity and facility to replace parts of the unit, in the case of failure or breaking.
Transparent elements.

Pipes:

Rough pipe 17 mm. diameter (PVC). Rough pipe 23 mm. diameter (PVC).
Smooth pipe 6.5 mm. diameter. (methacrylate).
Smooth pipe 16.5 mm. diameter (PVC). Smooth pipe 26.5 mm. diameter (PVC).

Pressure sensors:

2 differential pressure sensors. Range: 0-30 psi. Accuracy: 0.4 cm.
2 pressure sensors. Range: 0-30 psi. Accuracy: 1 cm.

34 pressure takings.

Flow sensor, range: 0-150 l/min.

Inclined seat valve. Floodgate valve. Ball valve. Flow regulation valves.

Inline strainer.

Membrane valve.

Abrupt broadening. Abrupt contraction.

Venturi tube of transparent plastic.

Diaphragm of transparent plastic.

Symmetrical bifurcation.

Two 90° elbows (in S).

T-junction. Inclined T-junction.

45° elbow. 90° elbow.

Pipes in parallel configurations.

Pipe section with a Pitot tube and static tapping.

Hydraulics Bench (FME00):

Mobile hydraulic bench, made in polyester reinforced with fibreglass, and mounted on wheels for mobility.

Centrifugal pump (computer controlled), 0.37 KW, 30-80 l/min at 20.1-12.8 m., single phase 220V./50Hz or 110V./60Hz. Runner made in stainless steel.

Sump tank capacity: 165 litres.

Small channel: 8 litres.

Flow measurement: volumetric tank, gauged from 0 to 7 litres for low flow values and from 0 to 40 litres for high flow values.

Control valve for regulating the flow.

Remote hand-operating dump valve in the base of the volumetric tank.

② AFTC/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.

Real time curves representation about system responses. 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.

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) = $\pm 10V$. Data transfers=DMA, interrupts, programmed I/O. DMA channels=6.

Analog output: Number of channels=2. Resolution= 16 bits, 1 in 65536. Max. output rate up to: 833 KS/s.

Output range(V) = $\pm 10V$. 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.

④ AFTC/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. 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.

⑤ Cables and Accessories, for normal operation.

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: AFTC + AFTC/CIB + DAB + AFTC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.



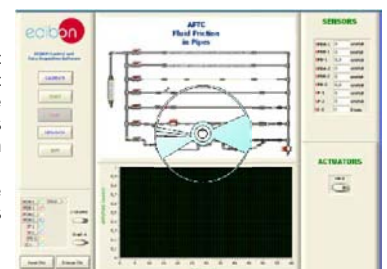
AFTC. Unit



AFTC/CIB



DAB



AFTC/CCSOF

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 V AC). DC input:16 (24 VDC).

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 AFTC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

⑨ AFT/CAL. Computer Aided Learning Software (Results Calculation and Analysis).

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use specifically developed by EDIBON.

CAL is a class assistant that helps making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

With a single click, CAL computes the value of all the variables involved. Also, CAL gives the option of plotting and printing the results.



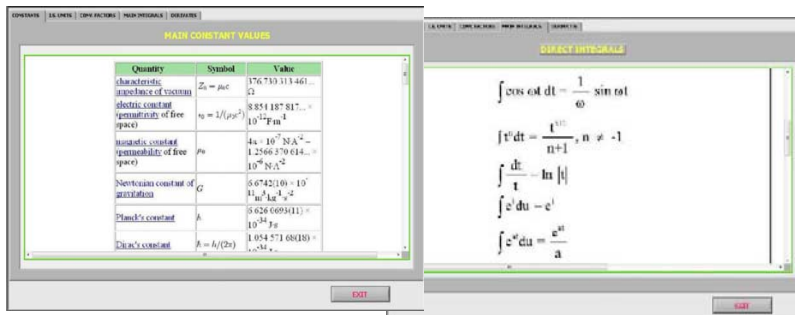
Simply insert the experimental data, with a single click CAL will perform the calculations.

Once the Area of study is selected, the right module can be chosen among a wide range, each one with its own set of lab exercises.



Between the plotting options, any variable can be represented against any other. And there exist a great range of different plotting displays.

Among the given choices, an additional help button can be found, which offers a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

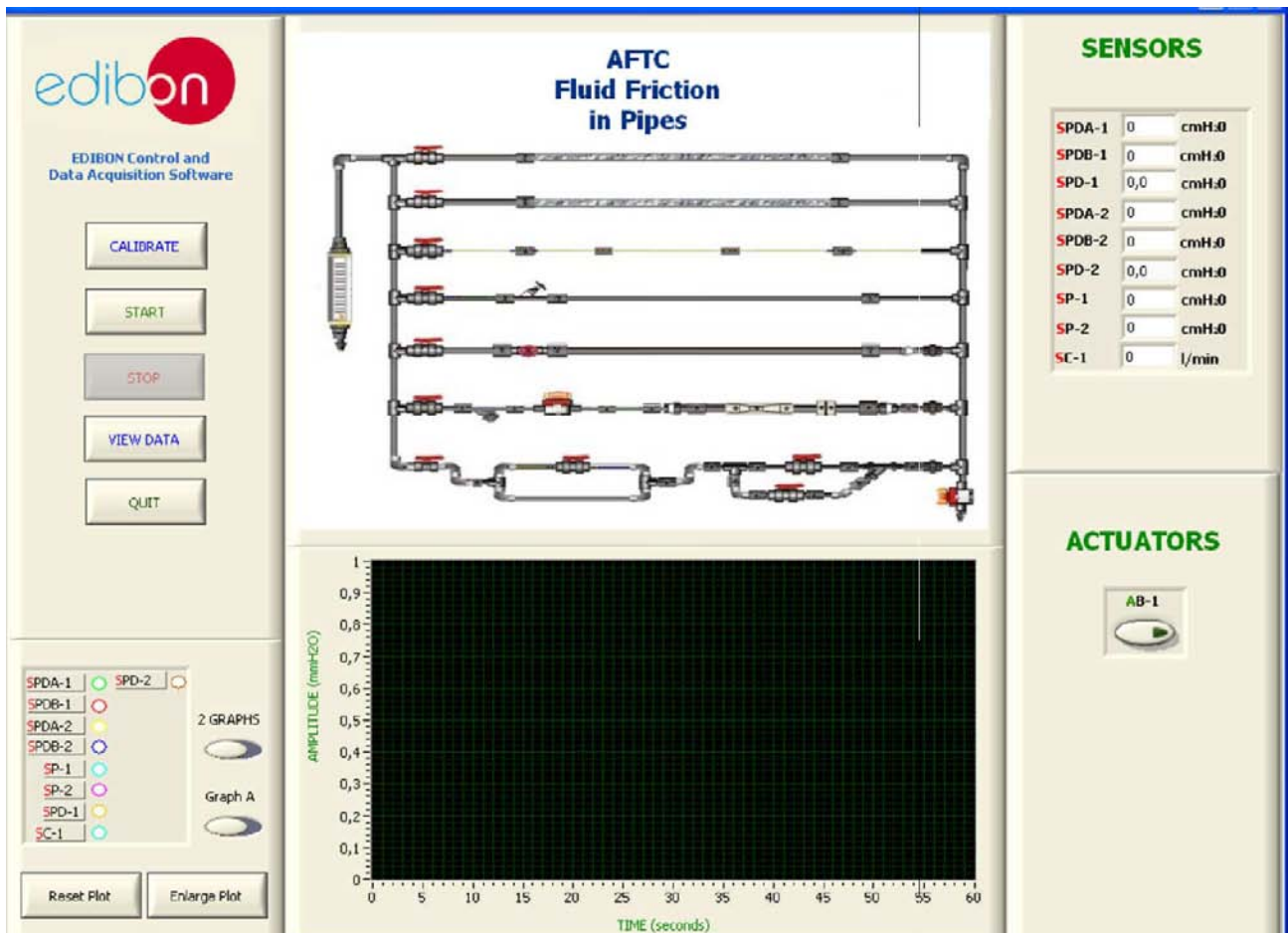


It includes a handy option to avoid using different reference sources while in progress. For example: the value of Physical constants, their symbols and right names, conversion factors and the very useful Integral and Derivative tables.

Items available on request**⑩ AFTC/FSS. Faults Simulation System.**

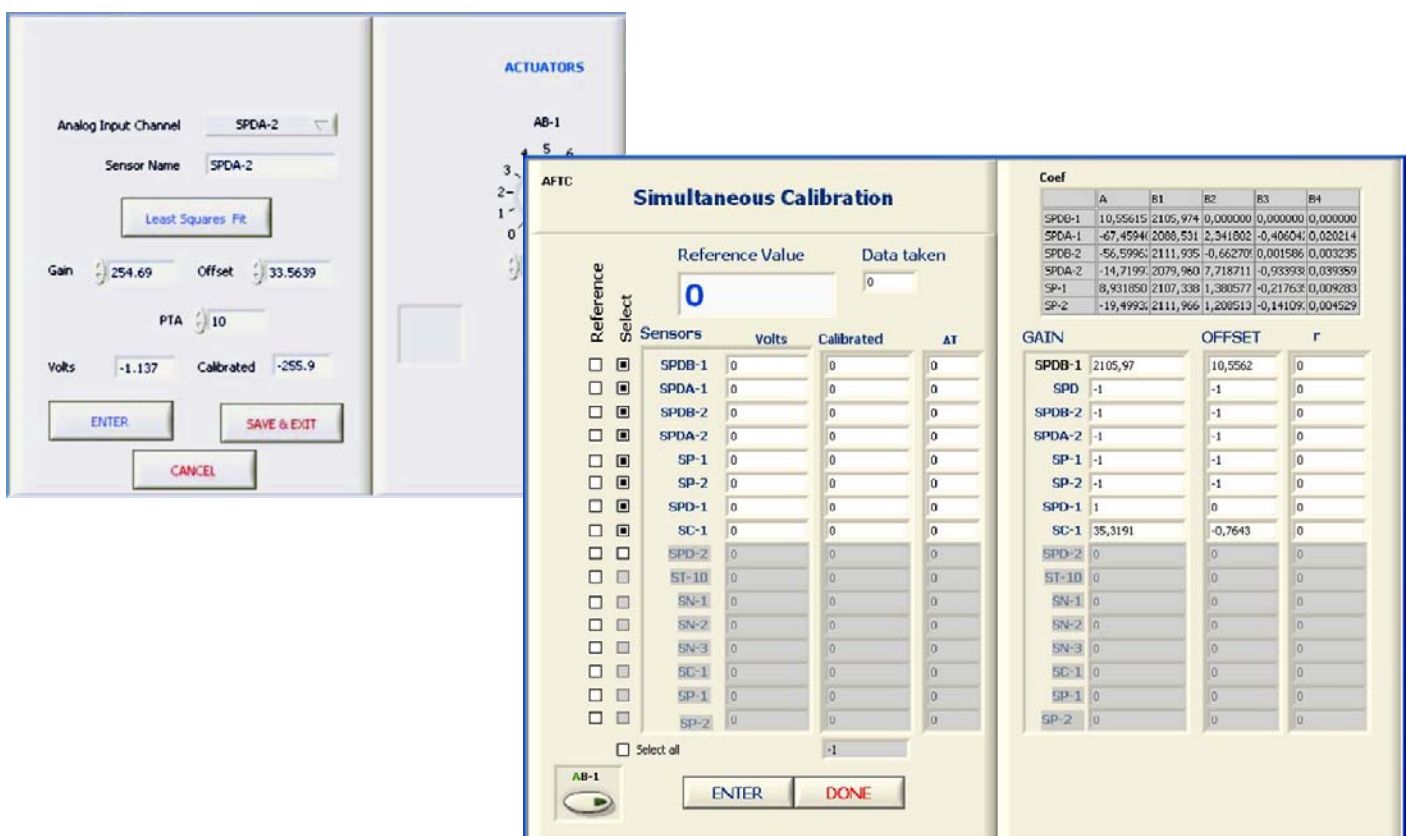
Software Main Screens

Main screen



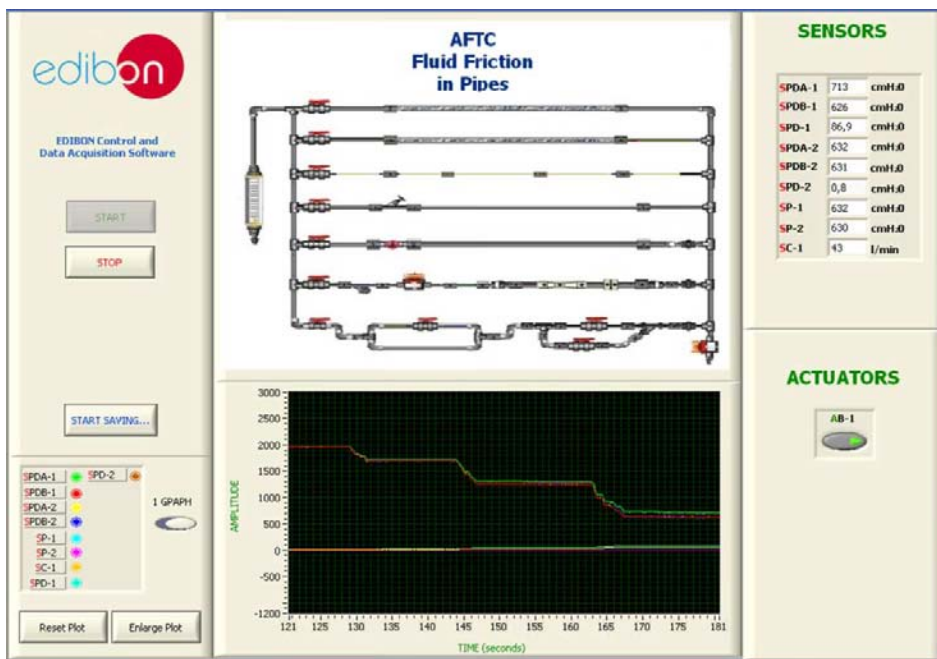
Note: SPD=Differential pressure sensor. SP=Pressure sensor. SC=Flow sensor. AB=Pump.

Examples of Sensors Calibration screens

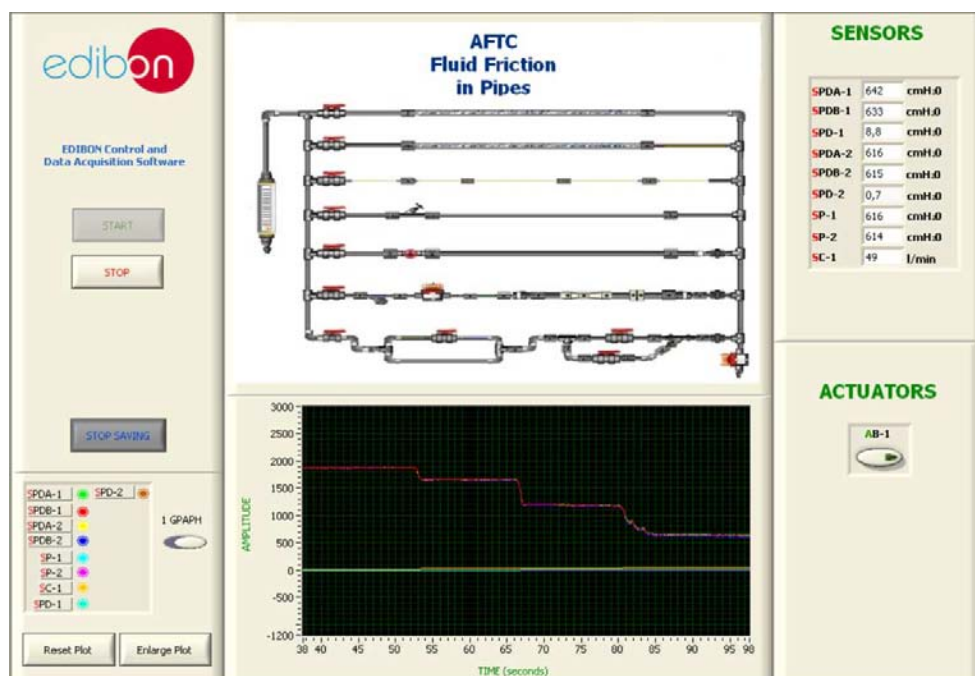


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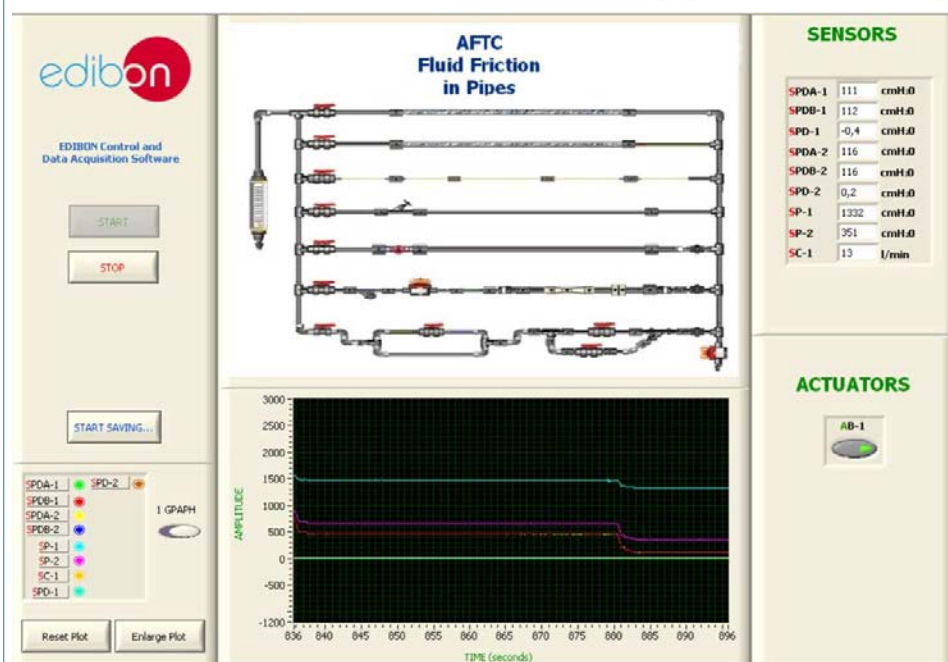
Some typical exercises results



Practice/exercise with the smooth pipe of 16.5 mm. diameter.



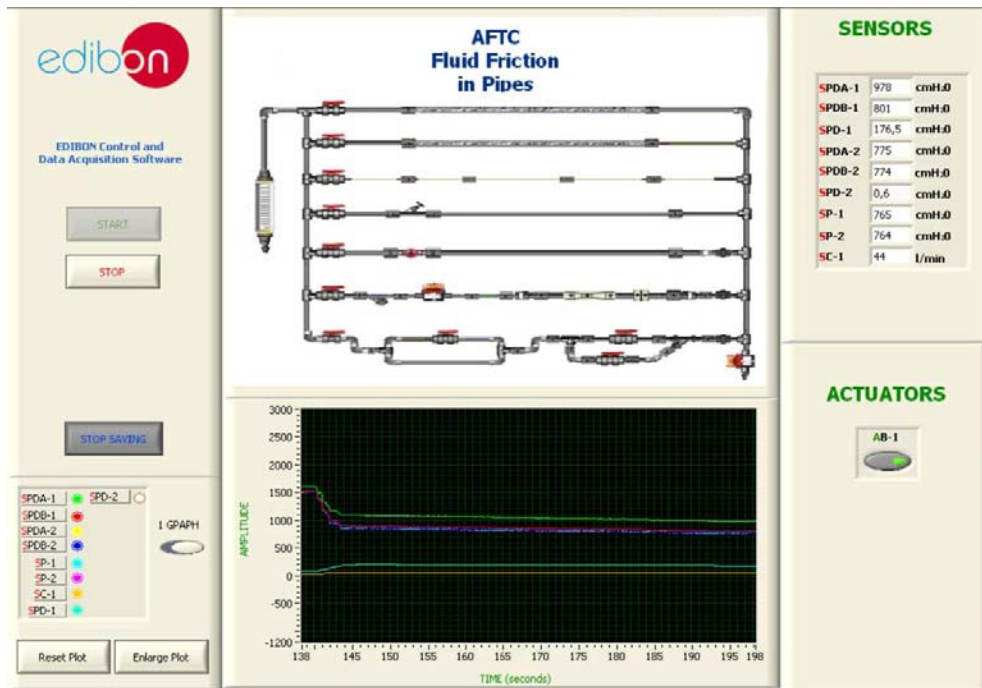
Practice/exercise with the smooth pipe of 26.5 mm. diameter.



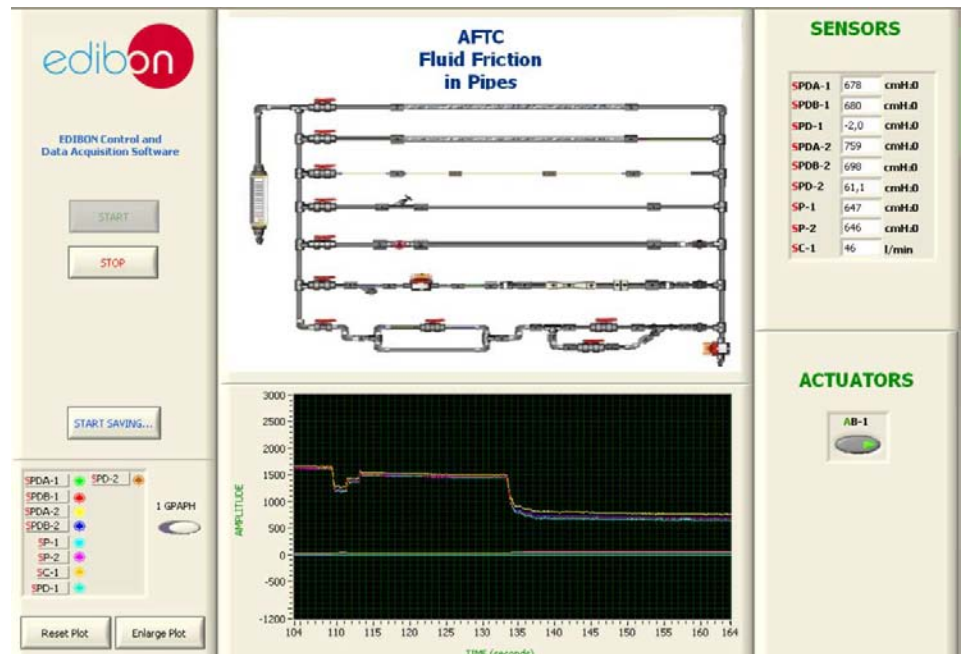
Practice/exercise with the smooth pipe of 6.5 mm. diameter.

Continue...

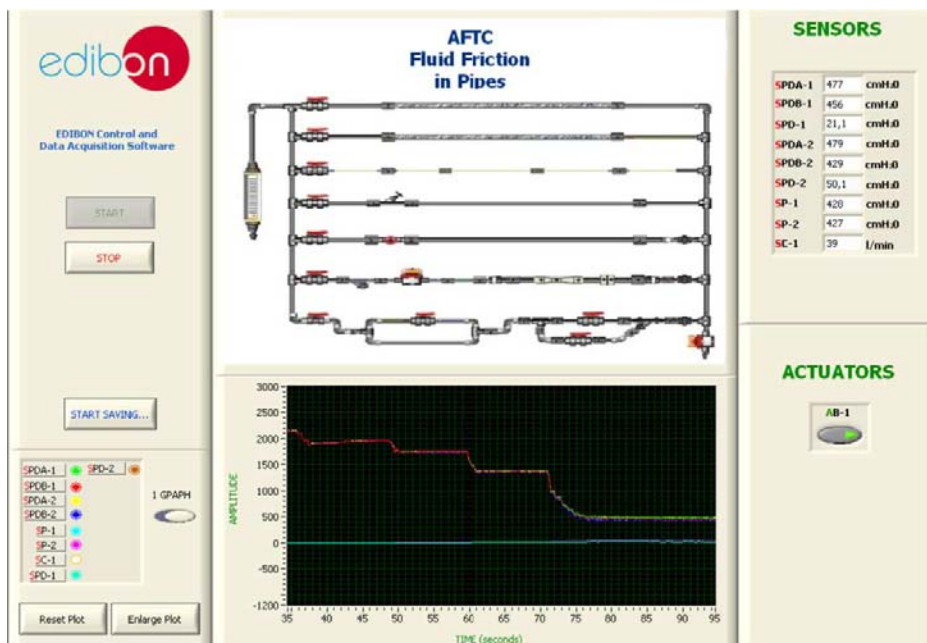
Some typical exercises results



Practice/exercise with the rough pipe of 17 mm. diameter.



Practice/exercise with the rough pipe of 23 mm. diameter.



Practice/exercise with the Venturi tube.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

- 1.- Load loss by friction in a rough pipe of 17 mm of interior diameter.
- 2.- Load loss by friction in a rough pipe of 23 mm of interior diameter.
- 3.- Load loss by friction in a smooth pipe of 6.5 mm of interior diameter.
- 4.- Load loss by friction in a smooth pipe of 16.5 mm of interior diameter.
- 5.- Load loss by friction in a smooth pipe of 26.5 mm of interior diameter.
- 6.- Influence of the diameter in the load loss by friction in rough pipes.
- 7.- Influence of the diameter in the load loss by friction in smooth pipes.
- 8.- Load loss by friction in smooth and rough pipes.
- 9.- Friction coefficient in a rough pipe of 17 mm of interior diameter.
- 10.- Friction coefficient in a rough pipe of 23 mm of interior diameter.
- 11.- Friction coefficient in a smooth pipe of 6.5 mm of interior diameter.
- 12.- Friction coefficient in a smooth pipe of 16.5 mm of interior diameter.
- 13.- Friction coefficient in a smooth pipe of 26.5 mm of interior diameter.
- 14.- Influence of the diameter in the friction coefficient in rough pipes.
- 15.- Influence of the diameter in the friction coefficient in smooth pipes.
- 16.- Friction coefficient in smooth and rough pipes.
- 17.- Load losses in the inclined seat valve.
- 18.- Load losses in the floodgate valve.
- 19.- Load losses in the filter.
- 20.- Load losses in the membrane valve.
- 21.- Load losses in an abrupt broadening.
- 22.- Load losses in the venturimeter.
- 23.- Load losses in the diaphragm.
- 24.- Load losses in an abrupt contraction.
- 25.- Load losses in the accessories.
- 26.- Flow measurements by load loss in a venturimeter.
- 27.- Flow measurements by load loss in a diaphragm.
- 28.- Flow measurements by means of load loss.
- 29.- Load losses in a symmetrical bifurcation.
- 30.- Load losses after two 90° elbows.
- 31.- Load losses in a T-junction.
- 32.- Load losses for a 90° elbows.
- 33.- Load losses on the ball valve.

- 34.- Load losses for an elbow of 45°.
- 35.- Load losses in a inclined T-junction.
- 36.- Study of laminar regime.
- 37.- Study of turbulent regime.

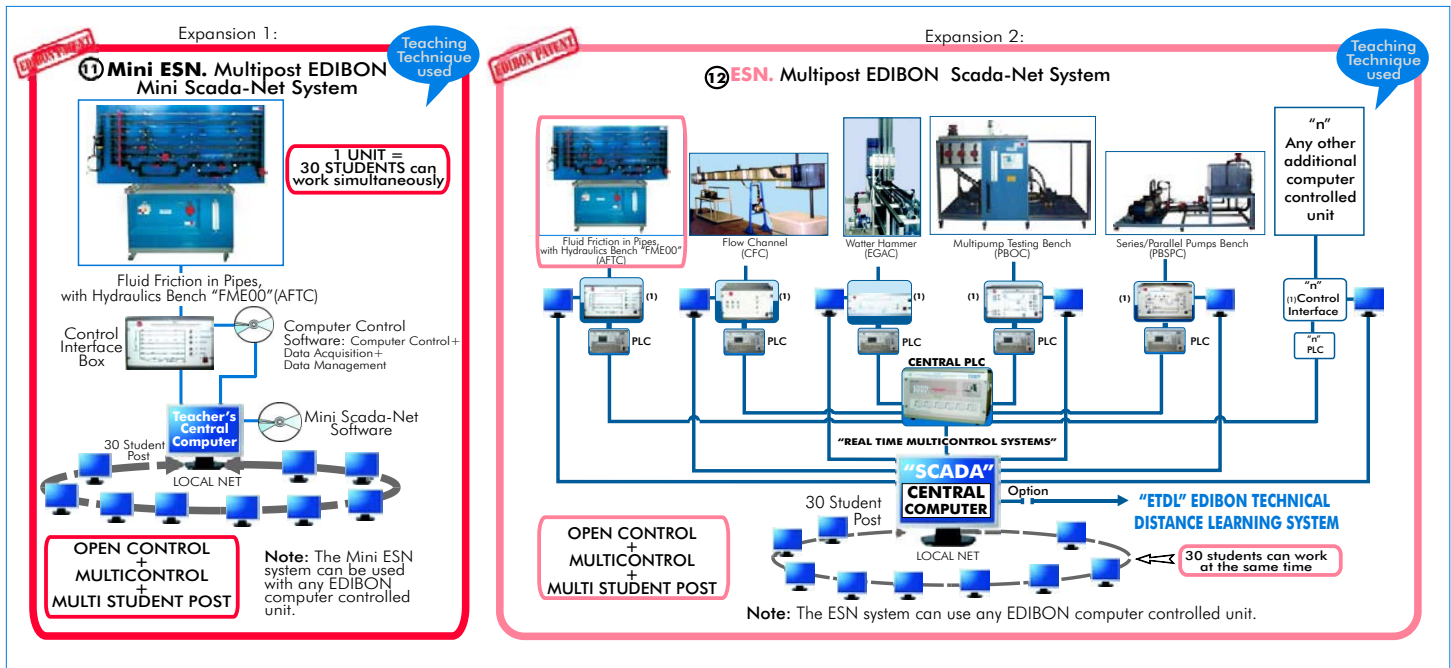
Other possible practices:

- 38.- Sensors calibration.

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

- 39.- Control of the AFTC unit process through the control interface box without the computer.
- 40.- Visualization of all the sensors values used in the AFTC unit process.
- 41.- Calibration of all sensors included in the AFTC unit process.
- 42.- Hand on of all the actuators involved in the AFTC unit process.
- 43.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
- 44.- 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).
- 45.- PLC hardware general use and manipulation.
- 46.- PLC process application for AFTC unit.
- 47.- PLC structure.
- 48.- PLC inputs and outputs configuration.
- 49.- PLC configuration possibilities.
- 50.- PLC program languages.
- 51.- PLC different programming standard languages (literal structured, graphic, etc.).
- 52.- New configuration and development of new process.
- 53.- Hand on an established process.
- 54.- To visualize and see the results and to make comparisons with the AFTC unit process.
- 55.- Possibility of creating new process in relation with the AFTC unit.
- 56.- PLC Programming Exercises.
- 57.- Own PLC applications in accordance with teacher and student requirements.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



ORDER INFORMATION

Items supplied as standard

Minimum configuration for normal operation includes:

- ① Unit: AFTC. Fluid Friction in Pipes, with Hydraulics Bench (FME00).
- ② AFTC/CIB. Control Interface Box.
- ③ DAB. Data Acquisition Board.
- ④ AFTC/CCSOF. Computer Control + Data Acquisition + Data Management Software.
- ⑤ Cables and Accessories, for normal operation.
- ⑥ Manuals.

*** IMPORTANT: Under AFTC 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):
- ⑦ PCL-PI. PLC Module.
- ⑧ AFTC/PLC-SOF. PLC Control Software.
- ⑨ AFTC/CAL. Computer Aided Learning Software (Results Calculation and Analysis).
- ⑩ AFTC/FSS. Faults Simulation System. (Available on request).

Expansions

- ⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System.
- ⑫ ESN. Multipost EDIBON Scada-Net System.

REQUIRED SERVICES

- Electrical supply: Single-phase 220-V/50Hz. or 110 V./60Hz.
- Water supply and drainage.
- Computer (PC).

DIMENSIONS & WEIGHTS

- | | |
|------------------------|--|
| AFTC Unit: | -Dimensions: 2100 x 850 x 2000 mm. approx. |
| | -Weight: 200 Kg. approx. |
| Control Interface Box: | -Dimensions: 490 x 330 x 310 mm. approx. |
| | -Weight: 10 Kg. approx. |
| PLC Module (PLC-PI): | -Dimensions: 490 x 330 x 310 mm. approx. |
| | -Weight: 30 Kg. approx. |

AVAILABLE VERSIONS

Offered in this catalogue:

- AFTC. Computer Controlled **Fluid Friction in Pipes, with Hydraulics Bench (FME00)**.

Offered in other catalogue:

- AFT. **Fluid Friction in Pipes, with Hydraulics Bench (FME00)**.
- AFT/B. **Fluid Friction in Pipes, with Basic Hydraulic Feed System (FME00/B)**.
- AFT/P. **Fluid Friction in Pipes** (only panel).

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



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REPRESENTATIVE:

