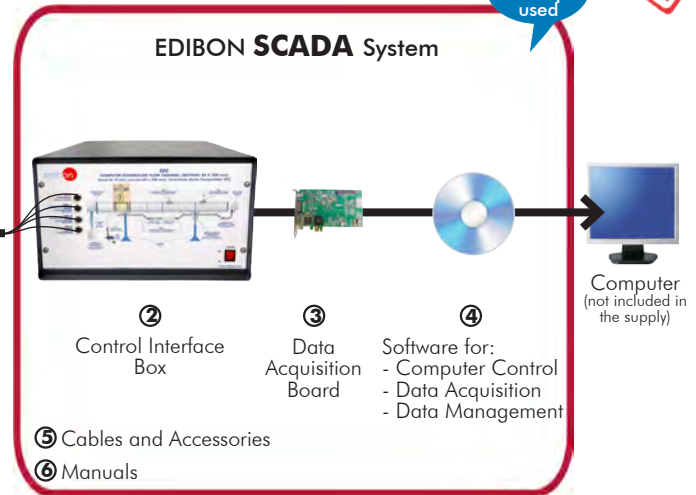


Computer Controlled Flow Channels (section: 80 x 300 mm), with SCADA

CFC

EDIBON PATENT

Teaching Technique used



① Unit: CFC. Computer Controlled Flow Channels (section: 80 x 300 mm)

* Minimum supply always includes: 1 + 2 + 3 + 4 + 5 + 6
(Computer not included in the supply)

Available versions to choose:

- CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 2.5 m.
- CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 5 m.

Key features:

- **Advanced Real-Time SCADA.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on LabVIEW.**
- **National Instruments Data Acquisition board (250 KS/s, kilo samples per second).**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**
- **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**
- **Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.**
Apart from monitoring user's knowledge and progress reached.
- **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**

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



www.edibon.com
PRODUCTS
80.- FLUID MECHANICS

For more information about Key Features, click here



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)



Certificate and Worlddidac Member

INTRODUCTION

Channels carry out an important role in engineering, embracing many situations in the flowing of liquids. This unit is designed for the study of several situations.

GENERAL DESCRIPTION

Channel, through which water flows, of rectangular section with transparent walls that enable to observe all the experiments. Water is taken from the storage tank by means of a hydraulic pump, with speed regulation, and, by the pipe, it is driven to the inlet tank, where there is a soothing of flow. After that, the water flows through the channel that discharges in the reception tank. Finally it comes back to the storage tank, completing the closed circuit.

The unit includes the instrumentation and the suitable sensors (flow, pressure, etc.) to control and to measure the most representative parameters.

To regulate the flow through the channel, there is a valve at the output of the pump.

To measure the flow there is an orifice plate flow sensor and a Venturi type flow sensor. The flow also can be measured with the flow sensor of the Basic Hydraulic Feed System (FME00/B).

A limnimeter (CFRMC) is required to measure water level. Besides, a Pitot tube with tubes manometer board (CFTPC) us required to measure velocity/flow.

The channel is assembled on two supports, with a system to control the inclination of the channel.

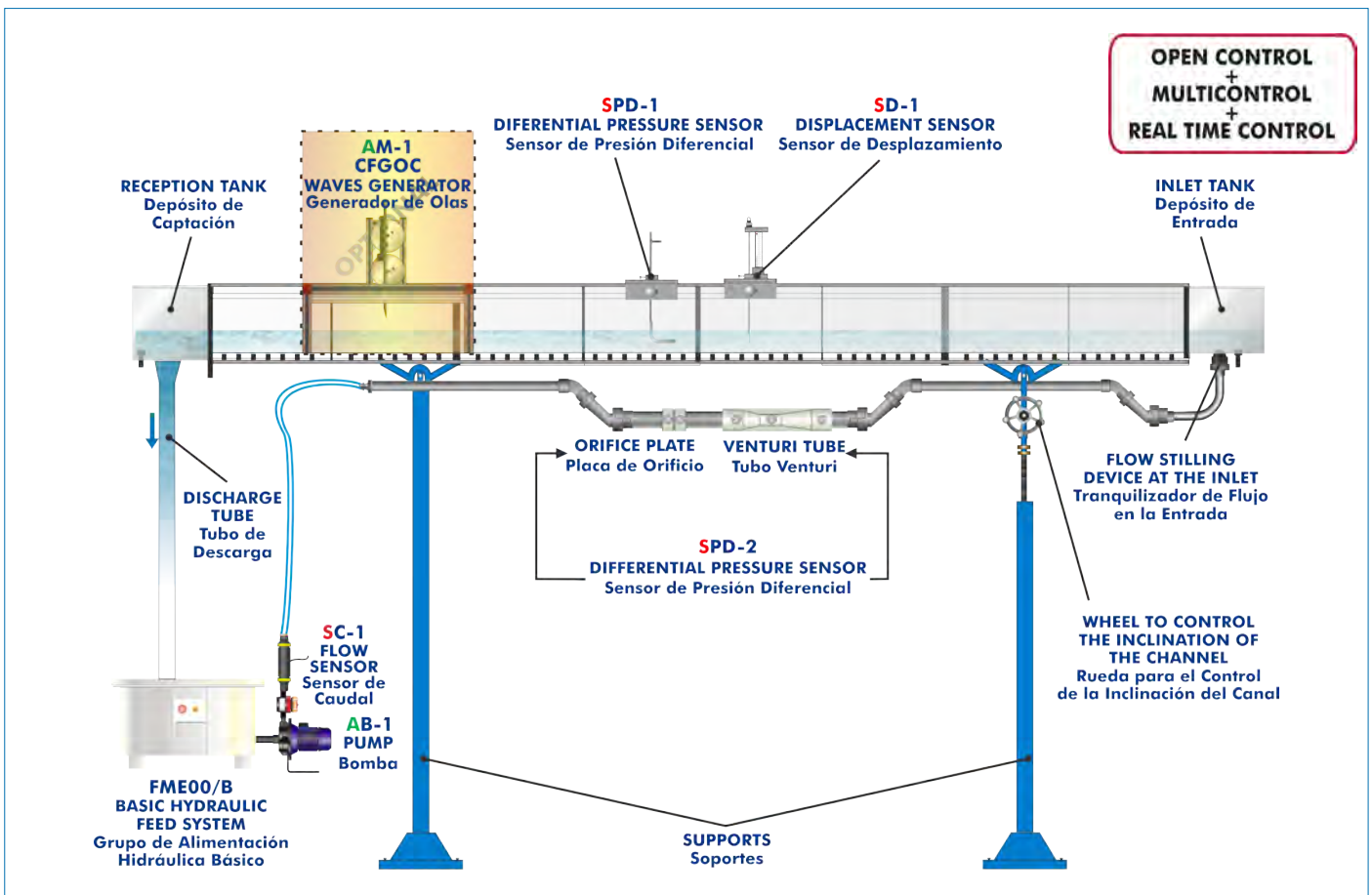
There is a wide range of available accessories.

This Computer Controlled Unit is supplied with the EDIBON Computer Control System (SCADA), and includes: The unit itself + a Control Interface Box + a Data Acquisition Board + Computer Control, Data Acquisition and Data Management Software Packages, for controlling the process and all parameters involved in the process.



Detail of CFC

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



With this unit there are several options and possibilities:

- Main items: 1, 2, 3, 4, 5 and 6.
- Optional items: 7, 8, 9 and 10.

Let us describe first the main items (1 to 6):

① CFC. Unit:

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.

Channel of rectangular section with transparent walls, formed by methacrylate transparent sections.

Available versions to choose:

- CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 2.5 m.
- CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 5 m.

The channel is assembled on supports, with a system to control the inclination of the channel. Channel slope adjustable.

Inlet tank (capacity: 38 l.), with stilling of flow and with drain valve.

Reception tank (capacity: 38 l.), with drain valve.

Pipes.

Orifice plate flow sensor.

Venturi type flow sensor.

FME00/B. Basic Hydraulic Feed System:

Storage tank (capacity: 140 l. approx.).

Impulsion pump, with speed regulation, computer controlled:

Single-phase, 220V/50Hz or 110V/60Hz.

0.37 KW.

2800 r.p.m.

30 - 80 l./min. at 20.1 - 12.8 m.

Safety switch ON/OFF.

Flow control valve.

Flow sensor.

Differential pressure sensor (included in CFTPC).

Displacement sensor (included in CFRMC).

The complete unit includes as well:

Advanced Real-Time SCADA.

Open Control + Multicontrol + Real-Time Control.

Specialized EDIBON Control Software based on LabVIEW.

National Instruments Data Acquisition board (250 KS/s, kilo samples per second).

Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.

Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.

Capable of doing applied research, real industrial simulation, training courses, etc.

Remote operation and control by the user and remote control for EDIBON technical support, are always included.

Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).

Designed and manufactured under several quality standards.

Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.

Apart from monitoring user's knowledge and progress reached.

This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.



Unit: CFC

Models and Accessories required:

- CFRMC. Level Gauge for Measurement of the Water Height (Hook and Point Gauge).
- CFTPC. Pitot Tube.

Optional Models and Accessories:

- CFPR. Adjustable Undershot Weir.
- CFCVR. Vertical Flat Gate and Radial Gate.
- CFVD. Sharp Crested Weir.
- CFVG. Broad Crested Weir.
- CFVC. Crump Weir.
- CFPV. Weirs.
- CFVOTP. Ogee Type Weir with Pressure Measurement.
- CFMDE. Energy Dissipation Accesories.
- CFSDL. Syphon Spillway.
- CFSDS. Air Regulated Syphon.
- CFMPL. Model of Plain Beach.
- CFMU. Model of Sill.
- CFMP. Models of Piers.
- CFMA. Models of Culvert.
- CFCA. Culvert Fitting.
- CFPVI. Set of Vibrating Piles.
- CFPLR. Artificial Roughened Bed.
- CFFS. False Floor Sections.
- CFVEN. Venturi Flume.
- CFRMD. Digital Water Level Indicator.
- CFMV. Velocity Meter.
- CFTVC. Differential Pressure Digital Indicator to Measure the Inlet Flow.
- CFAS. Sediment Feeder.
- CFGOC. Computer Controlled Wave Generator.
- CFTS. Sediment Trap.

② CFC/CIB. Control Interface Box:

The Control Interface Box is part of the SCADA system.

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 from -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.

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 displayed on only one screen in the computer.

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, heating elements, control valves, etc.

Real time computer control for parameters involved in the process simultaneously.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.

Three safety levels, one mechanical in the unit, another electronic in the control interface and the third one in the control software.



CFC/CIB

③ **DAB. Data Acquisition Board:**

The Data Acquisition board is part of the SCADA system.

PCI Express Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI Express.

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

Analog output:

Number of channels=2. Resolution=16 bits, 1 in 65536.

Maximum output rate up to: 900 KS/s.

Output range(V)=±10 V. Data transfers=DMA, interrupts, programmed I/O.

Digital Input/Output:

Number of channels=24 inputs/outputs. D0 or DI Sample Clock frequency: 0 to 100 MHz.

Timing: Number of Counter/timers=4. Resolution: Counter/timers: 32 bits.



DAB

④ **CFC/CCSOF. Computer Control + Data Acquisition + Data Management Software:**

The three softwares are part of the SCADA system.

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 simultaneous 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 KS/s (kilo samples per second).

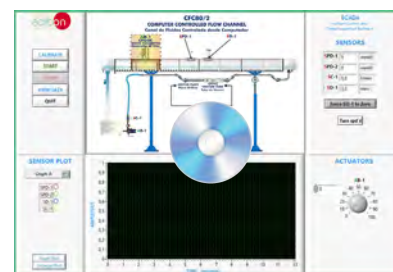
Calibration system for the sensors involved in the process.

It allows the registration of the alarms state and the graphic representation in real time.

Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

Open software, allowing 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 to different work levels.

This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.



CFC/CCSOF

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 are the main items: CFC + CFC/CIB + DAB + CFC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.

Models and Accessories required

CFRMC. Level Gauge for Measurement of the Water Height (Hook and Point Gauge)

In many cases it is decisive in hydraulics to know the discharge depth. The ruler to measure the height is used to measure the water level in the fluids channel.

The “CFRMC” accessory is an instrument formed by a probe tip in contact with water and the level is measured by a displacement sensor.

Its length is enough to enable the measurement of any water level in the channel and its main elements are made of stainless steel.

The accessory is mounted on a support that moves in the XYZ coordinates, which can be displayed up and down the length and width of the fluids channel.

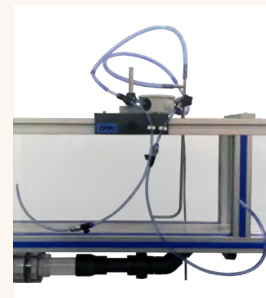


CFTPC. Pitot Tube

The Pitot tube is a device to measure the total pressure and the static pressure in a random point of the flow.

The pressure difference between the static pressure and the total pressure corresponds to the dynamic pressure from which the flow velocity and the flow rate in any point can be calculated.

The “CFTPC” accessory is a Pitot tube mounted on a movable support XYZ that can be displaced up and down the length and width of the channel, connected to a differential pressure sensor.



Optional Models and Accessories

CFPR. Adjustable Undershot Weir

One way to regulate the flow in a channel is by using control floodgates. When the floodgate is totally closed, the flow of water is blocked, and when it is open, water flows underneath and starts a flow circulating through the channel.

The “CFPR” accessory consists of a PVC floodgate mounted on a frame that can be displaced along the whole fluids channel. The floodgate can be fixed at the desired height, allowing for measuring that height.

It has flexible lateral reinforcements to assure water-tightness.



CFCVR. Vertical Flat Gate and Radial Gate

One way to regulate the flow in a channel is by using control floodgates. When the floodgate is totally closed, the flow of water is blocked, and when it is open, water flows underneath and starts a flow circulating through the channel.

Radial floodgates are part of movable control structures and are normally used together with fixed control structures to adjust the flow according to the necessity.

The “CFCVR” accessory consists of two floodgates, a flat vertical floodgate and a radial floodgate. The radial floodgate is mounted on a frame that can be displaced along the whole fluids channel. The floodgate can be fixed at the desired degree of inclination.

They have flexible lateral reinforcements to assure water-tightness.



CFVD. Sharp Crested Weir

Sharp crested weirs are hydraulic weirs used, generally, to measure flow rates. They are called sharp-crested weirs because the discharge is done through a plate whose profile, regardless its shape, ends in a sharp edge.

The "CFVD" accessory includes four PVC (with optional aeration, triangular, rectangular and trapezoidal) weirs lodge in slots, reinforced with flexible rubber, designed for that purpose at the outlet of the channel, guaranteeing water-tightness.



CFVG. Broad Crested Weir

Broad crested weirs have a lower discharge capacity for the same water load than sharp-crested weirs. They are most frequently used as level control structures, although they can also be calibrated and used as flow measurement structures.

The "CFVG" accessory includes a broad-crested weir made of PVC with thickness enough to keep the verticality of the weir and its non-deformation and with flexible lateral reinforcements to assure water-tightness. It can be fixed to any part of the bottom of the channel. The weir can be located by one or the other side, being one rounded and the other straight.



CFVC. Crump Weir

Crump weirs belong to control structures. It is a weir with triangular longitudinal profile, triangular transverse profile and smooth slopes. It is normally used as sill to reduce the flow rate and prevent erosion.

The "CFVC" accessory includes a critical weir made of PVC; it can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness. It has defined slopes upstream and downstream.

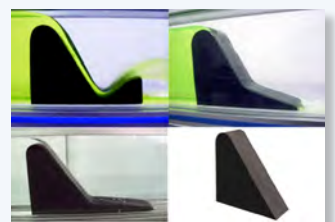


CFPV. Weirs

Ogee-shaped weirs are fixed weirs and belong to control structures. They are normally used to divert flows and create pools in a river.

The "CFPV" accessory includes three Ogee-shaped weirs with different discharge slopes.

They are made of PVC and can be fixed to any part of the bottom of the channel. They also have flexible lateral reinforcements to assure water-tightness.



CFVOTP. Ogee Type Weir with Pressure Measurement

Ogee-shaped weirs are fixed weirs and belong to control structures. They are normally used to divert flows and create pools in a river.

The back of the weir is normally made to facilitate the flow, having thus the largest discharge possible.

The "CFVOTP" accessory includes an Ogee-shaped weir with eight pressure tappings perpendicular to the surface. This way, pressure distribution along the back of the weir can be studied. It has tube manometers to measure pressure.

It can be fixed to any part of the bottom of the channel. It also has flexible lateral reinforcements to assure water-tightness.

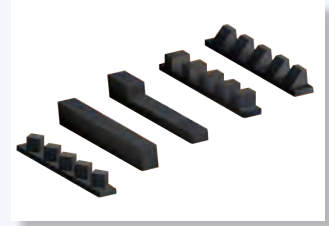


CFMDE. Energy Dissipation Accesories

The flow acquires kinetic energy during its descent. One of the aspects that generally deserves special attention when designing hydraulic works is to dissipate that kinetic energy. This situation arises in surplus weirs, waterfall structures, culvert outlets, etc.

Kinetic energy dissipation is achieved by applying different measures: generation of hydraulic jump, impact or roughness increase. The energy dissipating structure is an important part of the surplus work, whose objective is to dissipate the kinetic energy acquired by water when falling from the duct to an appropriate place at the bottom of the bed, where it does not generate erosion or scour problems.

The "CFMDE" accessory includes several energy dissipation elements, such as two jagged sills with five rectangular teeth, a jagged sill with five triangular teeth and two outlet sills with different heights. They can be fixed to any part of the channel either in a combined or individual way.



CFSDL. Syphon Spillway

One way to regulate the water level in a channel is by using syphons.

Syphon weirs are part of fixed weirs. They are installed as spillways in reservoirs and have a high specific discharge capacity.

When the level exceeds a specific height water flows through the syphon, being the upstream level regulated.

The syphon spillway designed by EDIBON can be fixed to any part of the bottom of the channel and it is made of PVC with walls made of PMMA to visualize flow lines. It has flexible lateral reinforcements to assure water-tightness.



CFSDS. Air Regulated Syphon

One way to regulate the water level in a channel is by using syphons.

Syphon weirs are part of fixed weirs. They are installed as spillways in reservoirs and have a high specific discharge capacity.

When the level exceeds a specific height water flows through the syphon, being the upstream level regulated.

The self-regulating syphon designed by EDIBON can be fixed to any part of the bottom of the channel and it is made of PVC with walls made of PMMA to visualize flow lines. It has flexible lateral reinforcements to assure water-tightness.



CFMPL. Model of Plain Beach

The "CFMPL" accessory represents an even beach that enables to study the breakers in an even beach. A wave generator is required to use this accessory.

It enables to regulate the slope of the beach to study the breakers with different conditions. It is made of PVC and has flexible lateral reinforcements to assure water-tightness.



CFMU. Model of Sill

Sills are normally used to reduce the slope of a channel and prevent erosion. Sills cause a constriction of the flow cross-section.

The "CFMU" accessory includes a sill made of PVC, which can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness.

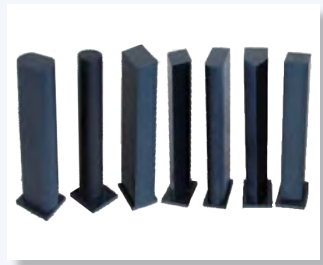


CFMP. Models of Piers

Piers in a channel are obstacles that reduce the flow cross-section. This way, a pool can be created in the water before the obstacles.

The "CFMP" accessory includes several bridge piers of different profile and a device to fix the pier to the test channel and rotate the pier, measuring the angle between the end of the pier and the flow, to study the influence of the angle of attack.

Different profiles are included: rectangular, square, circular, rounded on one end, rounded on both ends, tapered on one end and tapered on both ends.



CFMA. Models of Culvert

Culverts belong to crossing structures and enable the passage of water. They can be a sewer, syphon, aqueduct, bridge, etc.

The "CFMA" accessory consists of two crossing structures formed by a circular section hollow channel and a rectangular cross-section channel, which allow for observing the hydraulic jumps in culverts.

They can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness.

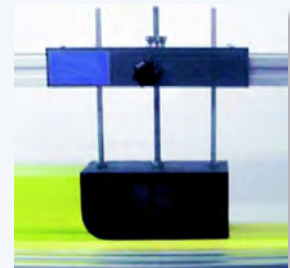


CFCA. Culvert Fitting

Culverts belong to crossing structures and enable the passage of water. They can be a sewer, syphon, aqueduct, bridge, etc.

The "CFCA" accessory is made of PVC and represents the connection of the channel to the culvert, allowing the regulation of its height.

They can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness.



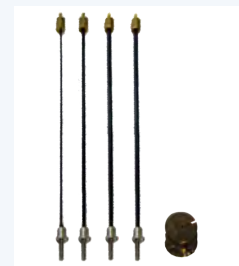
CFPVI. Set of Vibrating Piles

Drilling platforms, such as oil platforms, normally stand on piles in the water.

Circulating water exerts forces on the part of the piles immersed in the water and causes vibrations.

Karman vortexes can be generated in the flow around a pile. The separation of those vortexes makes the flow direction to be modified.

The "CFPVI" accessory allows to observe vibrating piles formed by rods of different diameter with weights added.



CFPLR. Artificial Roughened Bed

The flow behavior in a river depends particularly on slopes and the roughness of the base of the channel.

The "CFPLR" accessory consists of PVC plates with different elements (three different sizes) that allow for simulating in the fluids channel a riverbed of three different slopes. They can be fixed to any part of the bottom of the channel.



CFFS. False Floor Sections

The flow behavior in a river depends particularly on slopes and the roughness of the base of the channel.

The "CFFS" accessory consists of PVC plates with different material of different roughness that allow for simulating in the fluids channel a riverbed of three different roughness. They can be fixed to any part of the bottom of the channel.



CFVEN. Venturi Flume

In the same way that the Venturi meter in tubes is used to measure the flow in closed flows, the Venturi flume is used to measure the flow in open channels.

It consists of a base plate and two side pieces, producing a throttling in the section of the channel.

It is made of a transparent material that enables to visualize the flow inside.

It can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness.



CFRMD. Digital Water Level Indicator

In many cases it is decisive in hydraulics to know the discharge depth. The ruler to measure the height is used to measure the water level in the fluids channel.

The "CFRMD" accessory is an instrument formed by a probe tip in contact with water and the level is directly read in a display.

Its length is enough to enable the measurement of any water level in the channel and its main elements are made of stainless steel.

The accessory is mounted on a support that moves in the XYZ coordinates, which can be displayed up and down the length and width of the fluids channel.



CFMV. Velocity Meter

The "CFMV" accessory consists of a flow velocity meter. The device consists of a wheel with blades, which rotates proportionally to the flow velocity, read in a display.

The accessory can be displaced up and down the length and width of the fluids channel.



CFTVC. Differential Pressure Digital Indicator to Measure the Inlet Flow

The accessory is a differential pressure digital meter that measures up to 2 Bar. It is used with the Pitot tube (CFTPC) or Venturi type flow sensor to measure the inlet flow to the channel.



CFAS. Sediment Feeder

The "CFAS" accessory transports and measures out sediments of different grain size.

It consists of a vibrating hopper of 10 l. and an arm that enables to distribute the sediments in the channel uniformly. It is mounted on a rail to facilitate its motion along the whole channel.

This accessory requires the sediment trap, "CFTS".

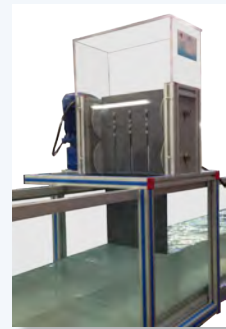


CFGOC. Computer Controlled Wave Generator

The "CFGOC" accessory enables to generate waves with a displacement plate that develops a rotating motion.

The plate is made of PVC and is driven by an electric motor with variable frequency drive. It enables the user to vary the frequency and amplitude of the waves through a computer.

It is located on a frame made of aluminum profiles that enables to place it in any part of the channel.



CFTS. Sediment Trap

Flows in rivers, channels and coastal zones are normally accompanied by sediment transport. In this case, the transport of sediments dragged by the current plays an important role, since solid matter moves in the base of the waters.

The "CFTS" accessory consists of a fine mesh located under the water outlet device, thus clean water flows to the tank. This way the sediments do not go to the pump or to the flowmeter, preventing them from blocking.

This accessory requires the sediment feeder, "CFAS".



EXERCISES AND PRACTICAL POSSIBILITIES TO BE DONE WITH THE MAIN ITEMS

- | | |
|--|---|
| <ol style="list-style-type: none"> 1.- Measurement of the water height and the velocity along the channel. 2.- Measurement of the flow with weirs of thin wall. 3.- Measurement of flow with changes in the channel section. 4.- Measurement of flow using Venturi flume. 5.- Control of the flow by gates. 6.- Level control using syphons. 7.- Flow on overflow dams. 8.- Flow among the pillars of a bridge. 9.- Connection of a channel to a culvert. 10.-Characterization of the hydraulic jump. 11.-Profiles of the water free surface. 12.-Investigation of flow and supercritical flow states. 13.-Measurement of water levels. 14.-Discharge processes on an underwater weir. 15.-Amount of energy in flows in open channels. 16.-Function of a syphon weir. 17.-Flow rate and drain coefficients of a syphon weir. 18.-Pipe flows. 19.-Comparison of overflow and syphon weirs. 20.-Observation of the throw of the water. 21.-Generation of different flow states by damming the downstream water. 22.-Observation of the flow under an undershot weir: <ul style="list-style-type: none"> - Observation of hydraulic motion on discharge. 23.-Relationship between dam height and discharge. 24.-Observation of discharges under a radial gate: <ul style="list-style-type: none"> - Observation of hydraulic motion on discharge. 25.-Hydrostatic pressure on a weir. 26.-Investigations on waves. 27.-Behaviour of structures in rough sea. 28.-Applying and understanding Manning's formula. 29.-Understanding sub- and super-critical flow. 30.-Learning how to apply force-momentum and steady flow energy equations to simple flow situations. | <ol style="list-style-type: none"> 31.-Investigation of the transition from running to shooting flow. <p>Additional practical possibilities:</p> <ol style="list-style-type: none"> 32.-Sensors calibration. 33.-Filling of the Pitot tube. 34.-Filling of the venturi meter with analog output. 35.-Calculation of water flow. 36.-Use of level gauge for measurement of the water height. <p>Other possibilities to be done with this Unit:</p> <ol style="list-style-type: none"> 37.-Many students view results simultaneously. <ul style="list-style-type: none"> To view all results in real time in the classroom by means of a projector or an electronic whiteboard. 38.-Open Control, Multicontrol and Real Time Control. <ul style="list-style-type: none"> This unit allows intrinsically and/or extrinsically to change the span, gains; proportional, integral, derivate parameters; etc, in real time. 39.-The Computer Control System with SCADA allows a real industrial simulation. 40.-This unit is totally safe as uses mechanical, electrical and electronic, and software safety devices. 41.-This unit can be used for doing applied research. 42.-This unit can be used for giving training courses to Industries even to other Technical Education Institutions. 43.-Control of the CFC unit process through the control interface box without the computer. 44.-Visualization of all the sensors values used in the CFC unit process. <ul style="list-style-type: none"> - By using PLC-PI additional 19 more exercises can be done. - Several other exercises can be done and designed by the user. |
|--|---|

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

- CFC80/2:**
- Dimensions: 3600 x 1000 x 1700 mm. approx.
(141.73 x 39.37 x 66.92 inches approx.)
 - Weight: 250 Kg. approx.
(551 pounds approx.).
- CFC80/5:**
- Dimensions: 6050 x 1000 x 1700 mm. approx.
(238.18 x 39.37 x 66.92 inches approx.)
 - Weight: 350 Kg. approx.
(771 pounds approx.).
- Control Interface Box:**
- 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.).

MODELS AND ACCESSORIES REQUIRED

- CFRMC. Level Gauge for Measurement of the Water Height (Hook and Point Gauge).
- CFTPC. Pitot Tube.

OPTIONAL MODELS AND ACCESSORIES

- CFPR. Adjustable Undershot Weir.
- CFCVR. Vertical Flat Gate and Radial Gate.
- CFVD. Sharp Crested Weir.
- CFVG. Broad Crested Weir.
- CFVC. Crump Weir.
- CFPV. Weirs.
- CFVOTP. Ogee Type Weir with Pressure Measurement.
- CFMDE. Energy Dissipation Accessories.
- CFSDL. Syphon Spillway.
- CFSDS. Air Regulated Syphon.
- CFMPL. Model of Plain Beach.
- CFMU. Model of Sill.
- CFMP. Models of Piers.
- CFMA. Models of Culvert.
- CFCA. Culvert Fitting.
- CFPVI. Set of Vibrating Piles.
- CFPLR. Artificial Roughened Bed.
- CFFS. False Floor Sections.
- CFVEN. Venturi Flume.
- CFRMD. Digital Water Level Indicator.
- CFMV. Velocity Meter.
- CFTVC. Differential Pressure Digital Indicator to Measure the Inlet Flow.
- CFAS. Sediment Feeder.
- CFGOC. Computer Controlled Wave Generator.
- CFTS. Sediment Trap.

AVAILABLE VERSIONS

Offered in this catalogue:

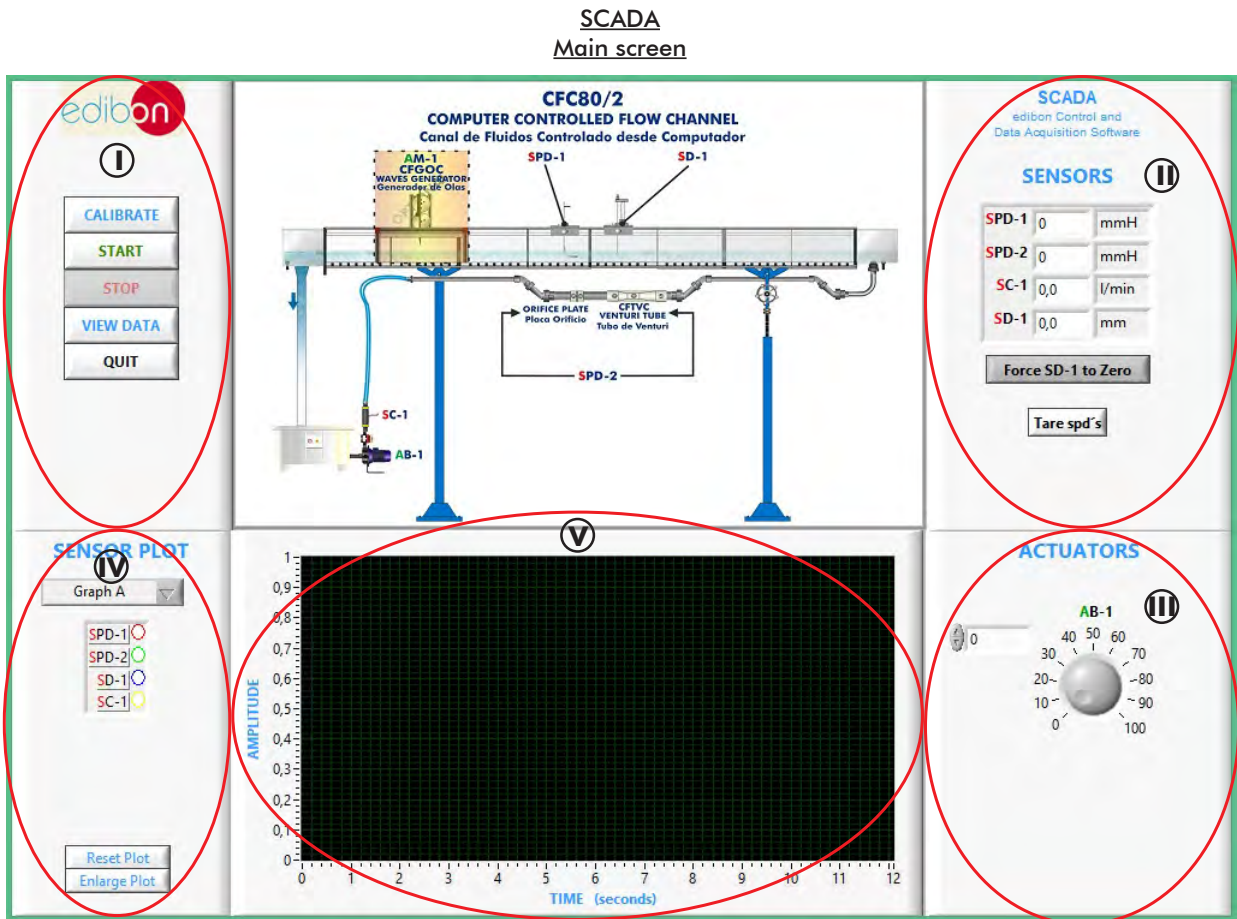
- CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 2.5 m.
- CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 5 m.

Offered in other catalogues:

- CF80/2. Flow Channel (section: 80 x 300 mm), length: 2.5 m.
- CF80/5. Flow Channel (section: 80 x 300 mm), length: 5 m.

- CFGC300/5. Computer Controlled Flow Channel (section: 300 x 450 mm), length: 5 m.
- CFGC300/7. Computer Controlled Flow Channel (section: 300 x 450 mm), length: 7.5 m.
- CFGC300/10. Computer Controlled Flow Channel (section: 300 x 450 mm), length: 10 m.
- CFGC300/12. Computer Controlled Flow Channel (section: 300 x 450 mm), length: 12.5 m.

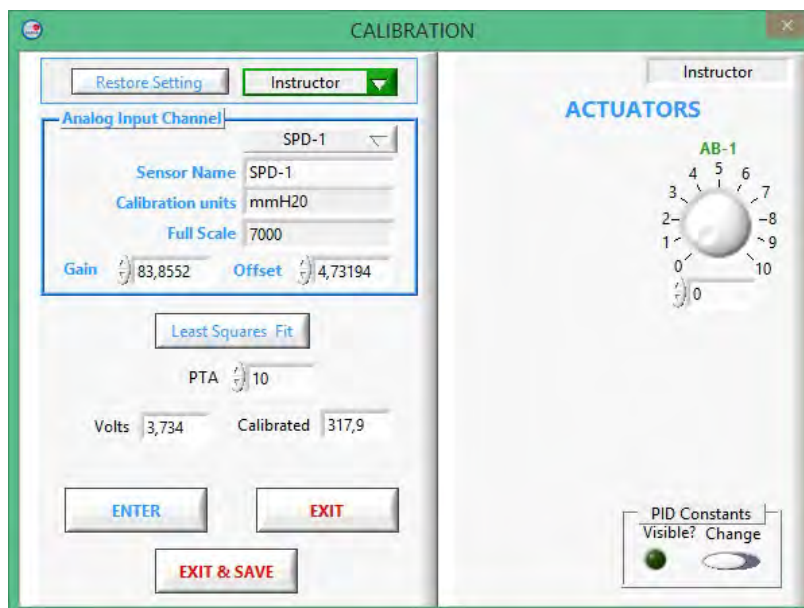
- CFG300/5. Flow Channel (section: 300 x 450 mm), length: 5 m.
- CFG300/7. Flow Channel (section: 300 x 450 mm), length: 7.5 m.
- CFG300/10. Flow Channel (section: 300 x 450 mm), length: 10 m.
- CFG300/12. Flow Channel (section: 300 x 450 mm), length: 12.5 m.



- ❶ Main software operation possibilities.
- ❷ Sensors displays, real time values, and extra output parameters. Sensors: SPD=Differential pressure sensor. SC=Flow sensor. SD=Displacement sensor.
- ❸ Actuators controls. Actuator: AB=Pump.
- ❹ Channel selection and other plot parameters.
- ❺ Real time graphics displays.

Software for Sensors Calibration

Example of screen



The teacher and the students can calibrate the unit with a password provided by EDIBON.
The teacher can restore the factory calibration any time.

Additionally to the main items (1 to 6) described, we can offer, as optional, other items from 7 to 10.

All these items try to give more possibilities for:

- a) Technical and Vocational Education configuration. (ICAI and FSS)
- b) Multipost Expansions options. (Mini ESN and ESN)

a) Industrial configuration

⑦ **PLC. Industrial Control using PLC** (it includes PLC-PI Module plus PLC-SOF Control Software):

-PLC-PI. PLC Module:

Metallic box.

Circuit diagram in the module 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 (-10 V. to + 10 V.) (through SCSI connector).

Analog outputs block:

4 Analog outputs (-10 V. to + 10 V.) (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. USB 2.0 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.

Power supply input (100 to 240 V AC).

DC input: 16 (24 V DC).

Relay output: 14.

High-speed counter.

Multi-point PID control.

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

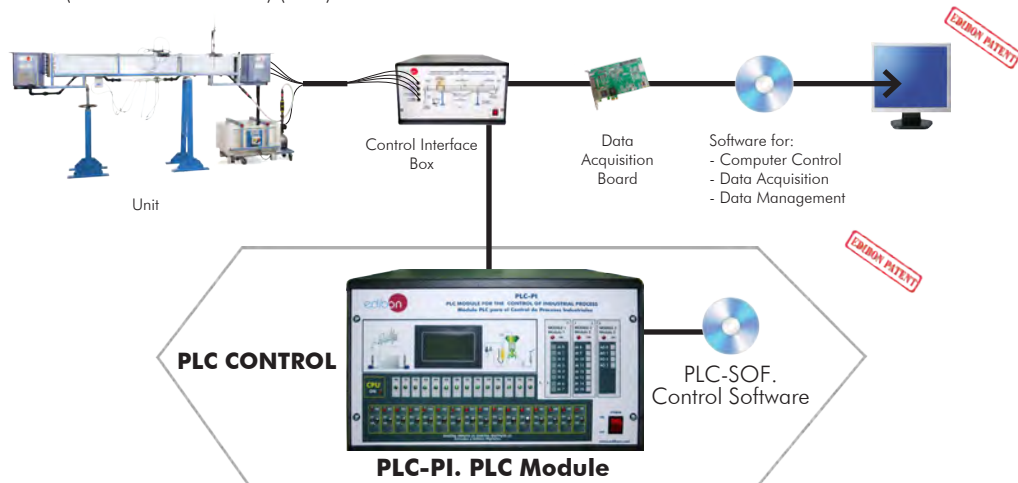
Communication RS232 wire to computer (PC).

Dimensions: 490 x 330 x 310 mm. approx. (19.29 x 12.99 x 12.20 inches approx.). Weight: 30 Kg. approx. (66 pounds approx.).

-CFC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

The software has been designed using Labview and it follows the unit operation procedure and linked with the Control Interface Box used in the Computer Controlled Flow Channels (section: 80 x 300 mm) (CFC).



Practices to be done with PLC-PI:

- 1.- Control of the particular unit process through the control interface box without the computer.
- 2.- Visualization of all the sensors values used in the particular unit process.
- 3.- Calibration of all sensors included in the particular unit process.
- 4.- Hand on of all the actuators involved in the particular unit process.
- 5.- Realization of different experiments, in automatic way, without having in front the particular unit. (These experiments can be decided previously).
- 6.- 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).
- 7.- PLC hardware general use.
- 8.- PLC process application for the particular unit.
- 9.- PLC structure.
- 10.- PLC inputs and outputs configuration.
- 11.- PLC configuration possibilities.
- 12.- PLC program languages.
- 13.- PLC different programming standard languages (ladder diagram (LD), structured text (ST), instructions list (IL), sequential function chart (SFC), function block diagram (FBD)).
- 14.- New configuration and development of new process.
- 15.- Hand on an established process.
- 16.- To visualize and see the results and to make comparisons with the particular unit process.
- 17.- Possibility of creating new process in relation with the particular unit.
- 18.- PLC Programming Exercises.
- 19.- Own PLC applications in accordance with teacher and student requirements.

b) Technical and Vocational Education configuration

⑧ **CFC/ICAI. Interactive Computer Aided Instruction Software System.**

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.

This software is optional and can be used additionally to items (1 to 6).

-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.

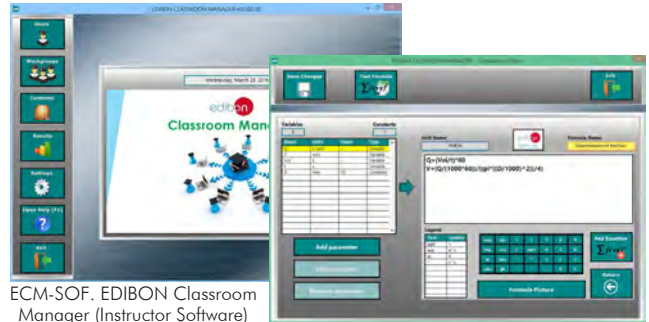
Creation and assignment of Formulas & Equations.

Equation System Solver Engine.

Updatable Contents.

Report generation, User Progression Monitoring and Statistics.

Instructor Software



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application main screen

ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

-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.

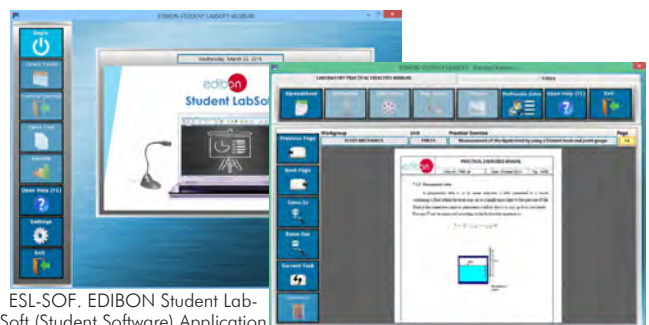
Calculations computing and plotting.

Equation System Solver Engine.

User Monitoring Learning & Printable Reports.

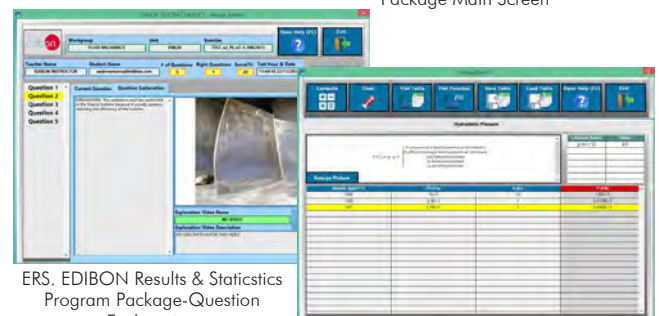
Multimedia-Supported auxiliary resources.

Student 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

For more information see ICAI catalogue. Click on the following link:

www.edibon.com/products/catalogues/en/ICAI.pdf

⑨ **CFC/FSS. Faults Simulation System.**

Faults Simulation System (FSS) is a Software package that simulates several faults in any EDIBON Computer Controlled Unit. It is useful for Technical and Vocational level.

The "FAULTS" mode consists in causing several faults in the unit normal operation. The student must find them and solve them. There are several kinds of faults that can be grouped in the following sections:

Faults affecting the sensors measurement:

- An incorrect calibration is applied to them.
- Non-linearity.

Faults affecting the actuators:

- Actuators channels interchange at any time during the program execution.
- Response reduction of an actuator.

Faults in the controls execution:

- Inversion of the performance in ON/OFF controls.
- Reduction or increase of the calculated total response.
- The action of some controls is annulled.

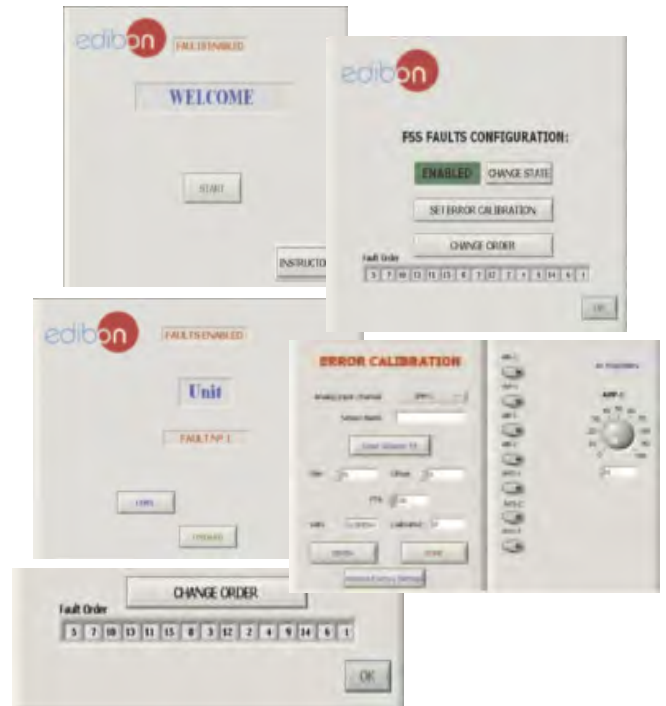
On/off faults:

- Several on/off faults can be included.

For more information see FSS catalogue. Click on the following link:

www.edibon.com/products/catalogues/en/FSS.pdf

Example of some screens



c) Multipost Expansions options

⑩ **Mini ESN. EDIBON Mini Scada-Net System.**

Mini ESN. EDIBON Mini Scada-Net System allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously. It is useful for both, Higher Education and/or Technical and Vocational Education.

The Mini ESN system consists of the adaptation of any EDIBON Computer Controlled Unit with SCADA integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit. Then, the number of possible users who can work with the same unit is higher than in an usual way of working (usually only one).

Main characteristics:

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

Main advantages:

- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

For more information see Mini ESN catalogue. Click on the following link:

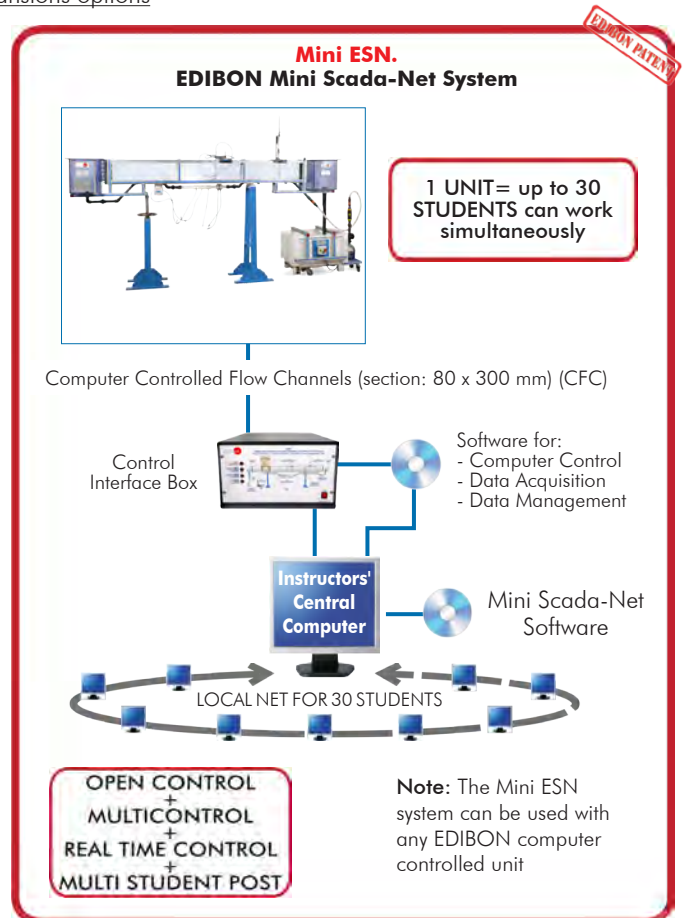
www.edibon.com/products/catalogues/en/Mini-ESN.pdf

⑪ **ESN. EDIBON Scada-Net System.**

This unit can be integrated, in the future, into a Complete Laboratory with many Units and many Students.

For more information see ESN catalogue. Click on the following link:

www.edibon.com/products/catalogues/en/units/fluidmechanicsaerodynamics/esn-fluidmechanics/ESN-FLUID_MECHANICS.pdf



ORDER INFORMATION

Main items (always included in the supply)

Minimum supply always includes:

- ① **Unit: CFC. Computer Controlled Flow Channels (section: 80 x 300 mm).**

Available versions to choose:

- **CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 2.5 m.**
- **CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 5 m.**

- ② **CFC/CIB. Control Interface Box.**
③ **DAB. Data Acquisition Board.**
④ **CFC/CCSOF. Computer Control + Data Acquisition + Data Management Software.**
⑤ **Cables and Accessories**, for normal operation.
⑥ **Manuals.**

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

Optional items (supplied under specific order)

a) Industrial configuration

- ⑦ **PLC. Industrial Control using PLC (it includes PLC-PI Module plus PLC-SOF Control Software):**
- PCL-PI. PLC Module.
 - CFC/PLC-SOF. PLC Control Software.

b) Technical and Vocational Education configuration

- ⑧ **CFC/ICAI. Interactive Computer Aided Instruction Software System.**
⑨ **CFC/FSS. Faults Simulation System.**

c) Multipost Expansions options

- ⑩ **Mini ESN. EDIBON Mini Scada-Net System.**
⑪ **ESN. EDIBON Scada-Net System.**

① CFC. Unit:

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.
 Channel of rectangular section with transparent walls, formed by methacrylate transparent sections.
Available versions to choose:
 - CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 2.5 m.
 - CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), length: 5 m.
 The channel is assembled on supports, with a system to control the inclination of the channel. Channel slope adjustable.
 Inlet tank (capacity: 38 l.), with stilling of flow and with drain valve.
 Reception tank (capacity: 38 l.), with drain valve.
 Pipes.
 Orifice plate flow sensor.
 Venturi type flow sensor.
 FME00/B. Basic Hydraulic Feed System:
 Storage tank (capacity: 140 l. approx.).
 Impulsion pump, with speed regulation, computer controlled:
 Single-phase, 220V/50Hz or 110V/60Hz.
 0.37 KW.
 2800 r.p.m.
 30 - 80 l./min. at 20.1 - 12.8 m.
 Safety switch ON/OFF.
 Flow control valve.
 Flow sensor.
 Differential pressure sensor (included in CFTPC).
 Displacement sensor (included in CFRMC).
 The complete unit includes as well:
 Advanced Real-Time SCADA.
 Open Control + Multicontrol + Real-Time Control.
 Specialized EDIBON Control Software based on LabVIEW.
 National Instruments Data Acquisition board (250 KS/s, kilo samples per second).
 Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.
 Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.
 Capable of doing applied research, real industrial simulation, training courses, etc.
 Remote operation and control by the user and remote control for EDIBON technical support, are always included.
 Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).
 Designed and manufactured under several quality standards.
 Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.
 Apart from monitoring user's knowledge and progress reached.
 This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.

Models and Accessories required:

- CFRMC. Level Gauge for Measurement of the Water Height (Hook and Point Gauge).
- CFTPC. Pitot Tube.

Optional Models and Accessories:

- CFPR. Adjustable Undershot Weir.
- CFCVR. Vertical Flat Gate and Radial Gate.
- CFVD. Sharp Crested Weir.
- CFVG. Broad Crested Weir.
- CFVC. Crump Weir.
- CFPV. Weirs.
- CFVOTP. Ogee Type Weir with Pressure Measurement.
- CFMDE. Energy Dissipation Accessories.
- CFSDL. Syphon Spillway.
- CFSDS. Air Regulated Syphon.
- CFMPL. Model of Plain Beach.
- CFMU. Model of Sill.
- CFMP. Models of Piers.
- CFMA. Models of Culvert.
- CFCA. Culvert Fitting.
- CFPVI. Set of Vibrating Piles.
- CFPLR. Artificial Roughened Bed.
- CFFS. False Floor Sections.
- CFVEN. Venturi Flume.
- CFRMD. Digital Water Level Indicator.
- CFMV. Velocity Meter.
- CFTVC. Differential Pressure Digital Indicator to Measure the Inlet Flow.
- CFAS. Sediment Feeder.
- CFGOC. Computer Controlled Wave Generator.
- CFTS. Sediment Trap.

② CFC/CIB. Control Interface Box:

The Control Interface Box is part of the SCADA system.
 Control interface box with process diagram in the front panel.
 The unit control elements are permanently computer controlled.
 Simultaneous 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.
 All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.
 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 parameters involved in the process simultaneously.
 Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.
 Three safety levels, one mechanical in the unit, another electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

The Data Acquisition board is part of the SCADA system.
 PCI Express Data acquisition board (National Instruments) to be placed in a computer slot.
 Analog input: Channels= 16 single-ended or 8 differential. Resolution= 16 bits, 1 in 65536. Sampling rate up to: 250 KS/s (kilo samples per second).
 Analog output: Channels=2. Resolution= 16 bits, 1 in 65536.
 Digital Input/Output: Channels=24 inputs/outputs.

④ CFC/CCSOF. Computer Control + Data Acquisition+ Data Management Software:

The three softwares are part of the SCADA system.
 Compatible with the industry standards.
 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 KS/s (kilo samples per second).
 Calibration system for the sensors involved in the process.
 It allows the registration of the alarms state and the graphic representation in real time.
 Open software, allowing 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 to different work levels.
 This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

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.

Exercises and Practical Possibilities to be done with the Main Items

- 1.- Measurement of the water height and the velocity along the channel.
 - 2.- Measurement of the flow with weirs of thin wall.
 - 3.- Measurement of flow with changes in the channel section.
 - 4.- Measurement of flow using Venturi flume.
 - 5.- Control of the flow by gates.
 - 6.- Level control using syphons.
 - 7.- Flow on overflow dams.
 - 8.- Flow among the pillars of a bridge.
 - 9.- Connection of a channel to a culvert.
 - 10.-Characterization of the hydraulic jump.
 - 11.-Profiles of the water free surface.
 - 12.-Investigation of flow and supercritical flow states.
 - 13.-Measurement of water levels.
 - 14.-Discharge processes on an underwater weir.
 - 15.-Amount of energy in flows in open channels.
 - 16.-Function of a syphon weir.
 - 17.-Flow rate and drain coefficients of a syphon weir.
 - 18.-Pipe flows.
 - 19.-Comparison of overflow and syphon weirs.
 - 20.-Observation of the throw of the water.
 - 21.-Generation of different flow states by damming the down-stream water.
 - 22.-Observation of the flow under an undershot weir:
 - Observation of hydraulic motion on discharge.
 - 23.-Relationship between dam height and discharge.
 - 24.-Observation of discharges under a radial gate:
 - Observation of hydraulic motion on discharge.
 - 25.-Hydrostatic pressure on a weir.
 - 26.-Investigations on waves.
 - 27.-Behaviour of structures in rough sea.
 - 28.-Applying and understanding Manning's formula.
 - 29.-Understanding sub- and super-critical flow.
 - 30.-Learning how to apply force-momentum and steady flow energy equations to simple flow situations.
 - 31.-Investigation of the transition from running to shooting flow.
- Additional practical possibilities:
- 32.-Sensors calibration.
 - 33.-Filling of the Pitot tube.
 - 34.-Filling of the venturi meter with analog output.
 - 35.-Calculation of water flow.
 - 36.-Use of level gauge for measurement of the water height.
- Other possibilities to be done with this Unit:
- 37.-Many students view results simultaneously.
 - To view all results in real time in the classroom by means of a projector or an electronic whiteboard.
 - 38.-Open Control, Multicontrol and Real Time Control.
 - This unit allows intrinsically and/or extrinsically to change the span, gains; proportional, integral, derivate parameters; etc, in real time.
 - 39.-The Computer Control System with SCADA allows a real industrial simulation.
 - 40.-This unit is totally safe as uses mechanical, electrical and electronic, and software safety devices.
 - 41.-This unit can be used for doing applied research.
 - 42.-This unit can be used for giving training courses to Industries even to other Technical Education Institutions.
 - 43.-Control of the CFC unit process through the control interface box without the computer.
 - 44.-Visualization of all the sensors values used in the CFC unit process.
 - By using PLC-PI additional 19 more exercises can be done.
 - Several other exercises can be done and designed by the user.

a) Industrial configuration

⑦ PLC. Industrial Control using PLC (it includes PLC-PI Module plus PLC-SOF Control Software):

-PLC-PI. PLC Module:

Metallic box.
 Circuit diagram in the module front panel.
 Digital inputs (X) and Digital outputs (Y) block: 16 Digital inputs. 14 Digital outputs.
 Analog inputs block: 16 Analog inputs.
 Analog outputs block: 4 Analog outputs.
 Touch screen.
 Panasonic PLC:
 High-speed scan of 0.32 μ sec. Program capacity of 32 Ksteps. High-speed counter. Multi-point PID control.
 Digital inputs/outputs and analog inputs/outputs Panasonic modules.

-CFC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

Practices to be done with PLC-PI:

- 1.- Control of the particular unit process through the control interface box without the computer.
- 2.- Visualization of all the sensors values used in the particular unit process.
- 3.- Calibration of all sensors included in the particular unit process.
- 4.- Hand on of all the actuators involved in the particular unit process.
- 5.- Realization of different experiments, in automatic way, without having in front the particular unit. (These experiments can be decided previously).
- 6.- 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).
- 7.- PLC hardware general use.
- 8.- PLC process application for the particular unit.
- 9.- PLC structure.
- 10.- PLC inputs and outputs configuration.
- 11.- PLC configuration possibilities.
- 12.- PLC program languages.
- 13.- PLC different programming standard languages (ladder diagram (LD), structured text (ST), instructions list (IL), sequential function chart (SFC), function block diagram (FBD)).
- 14.- New configuration and development of new process.
- 15.- Hand on an established process.
- 16.- To visualize and see the results and to make comparisons with the particular unit process.
- 17.- Possibility of creating new process in relation with the particular unit.
- 18.- PLC Programming Exercises.
- 19.- Own PLC applications in accordance with teacher and student requirements.

b) Technical and Vocational Education configuration

⑧ CFC/ICAI. Interactive Computer Aided Instruction Software System.

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.

-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.

-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.

Tender Specifications (for optional items)

b) Technical and Vocational Education configuration

⑨ **CFC/FSS. Faults Simulation System.**

Faults Simulation System (FSS) is a Software package that simulates several faults in any EDIBON Computer Controlled Unit. The "FAULTS" mode consists in causing several faults in the unit normal operation. The student must find them and solve them. There are several kinds of faults that can be grouped in the following sections:

Faults affecting the sensors measurement:

- An incorrect calibration is applied to them.
- Non-linearity.

Faults affecting the actuators:

- Actuators channels interchange at any time during the program execution.
- Response reduction of an actuator.

Faults in the controls execution:

- Inversion of the performance in ON/OFF controls.
- Reduction or increase of the calculated total response.
- The action of some controls is annulled.

On/off faults:

- Several on/off faults can be included.

c) Multipost Expansions options

⑩ **Mini ESN. EDIBON Mini Scada-Net System.**

EDIBON Mini Scada-Net System allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously.

The Mini ESN system consists of the adaptation of any EDIBON Computer Controlled Unit with SCADA integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit.

Main characteristics:

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

Main advantages:

- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

The system basically will consist of:

This system is used with a Computer Controlled Unit.

- Instructor's computer.
- Students' computers.
- Local Network.
- Unit-Control Interface adaptation.
- Unit Software adaptation.
- Webcam.
- Mini ESN Software to control the whole system.
- Cables and accessories required for a normal operation.

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



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REPRESENTATIVE: