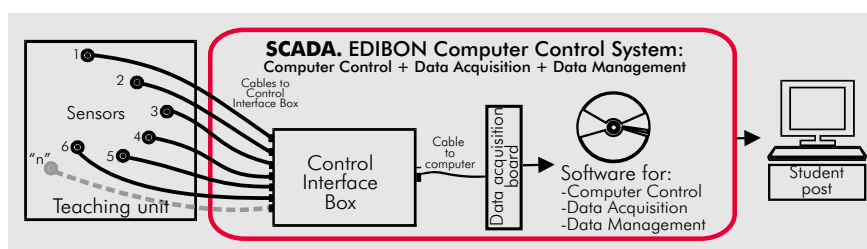


① Unit: CFC. Computer Controlled Flow Channels (section: 80 x 300 mm)

Available Versions:

- 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.

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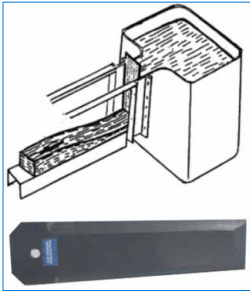
CFTPC. Pitot tube and manometer board



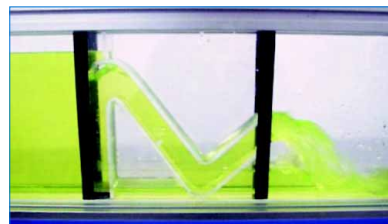
CFRMC. Level gauge for measurement of the water height (hook and point gauge)



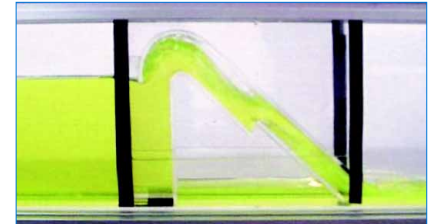
CFVDGC. Broad and thin crested weirs



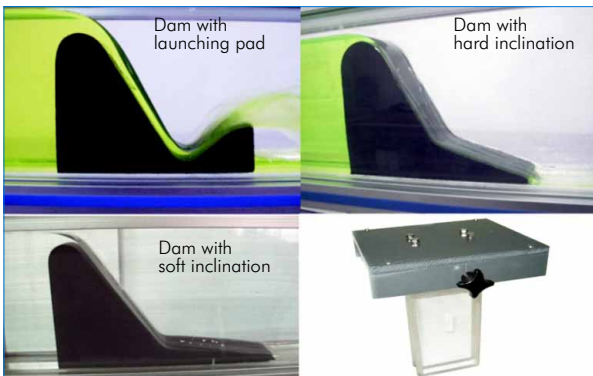
CFCVRC. Vertical flat gate and radial gate



CFSDLC. Syphon spillway



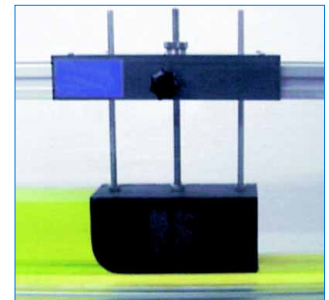
CFSDSC. Air regulated syphon



CFPVPC. Dams spillway and flow splitters (3 different models of dams)



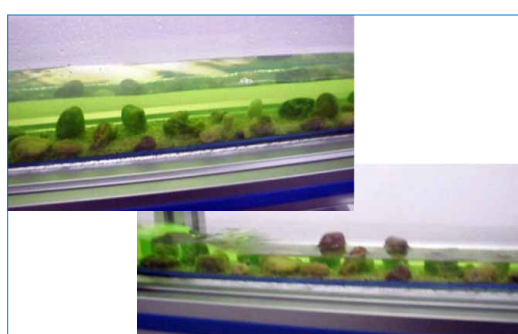
CFVCC. Crump weir



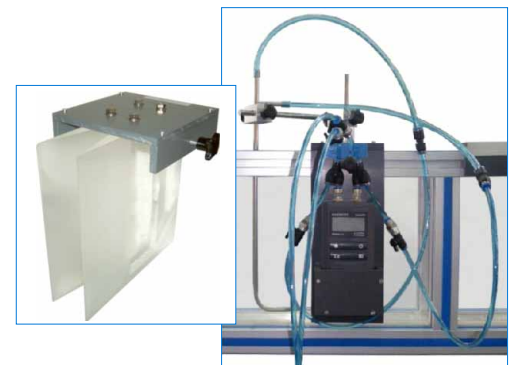
CFCAC. Culvert fitting



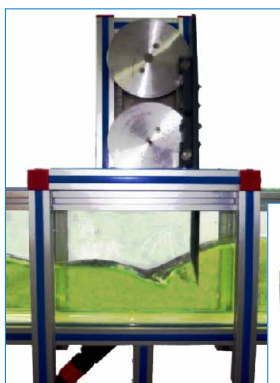
CFVENC. Venturi flume



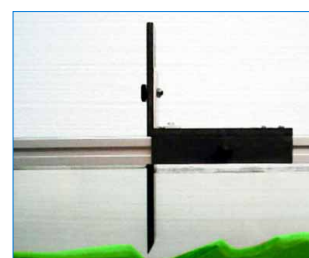
CFPLRC. Artificial roughened bed (3 different models)



CFTVCC. Venturi tube, with pressure transducers, converter and differential pressure digital indicator for input flow measurement



CFGOC. Wave generator



CFPRC. Adjustable undershot weir

**Items supplied as standard**

**① CFC. Unit:**

Anodized aluminium structure and supports in painted steel. Main metallic elements in stainless steel.  
Channel of rectangular section with transparent walls, formed by methacrylate transparent sections.

There are several channel versions to chose:

- 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 litres), with stilling of flow and with drain valve.

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

Flow control valve.

Pipes.

FME00/B. Basic Hydraulic Feed System:

Storage tank (capacity: 140 litres approx).

Impulsion pump (computer controlled):

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

0.37 KW.

2800 r.p.m.

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

Safety switch ON/OFF.

Flowmeter.

Flow control valve.

Flow sensors.

Pressure sensors.

Wide range of available accessories.

**Available accessories:** (not included in the standard supply)

CFTPC. Pitot tube and manometer board.

CFRMC. Level gauge for measurement of the water height (hook and point gauge).

CFVDGC. Broad and thin crested weirs. (One broad weir and 2 thin weirs).

CFCVRC. Vertical flat gate and radial gate.

CFS DLC. Syphon spillway.

CFPVPC. Dams spillway (3 different models) and flow splitters.

CFCAC. Culvert fitting.

CFVCC. Crump weir.

CFVENC. Venturi flume.

CFSDSC. Air regulated syphon.

CFFSC. False floor sections. (2 different models).

CFPLRC. Artificial roughened bed. (3 different models).

CFTVCC. Venturi tube, with pressure transducers, converter and differential pressure digital indicator for input flow measurement.

CFGOC. Wave generator.

CFPRC. Adjustable undershot weir.



CFC. Unit

**② CFC/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 from -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.



CFC/CIB

**③ DAB. Data Acquisition Board:**

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

Analog input: Number of channels= 16 single-ended or 8 differential. Resolution= 16 bits, 1 in 65536.

Sampling rate up to: 250 KS/s (Kilo samples per second).

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

Analog output: 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: Channels=24 inputs/outputs. D0 or DI Sample Clock frequency: 0 to 1 MHz.

Timing: Counter/timers=2. Resolution: Counter/timers: 32 bits.



DAB

**④ CFC/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. 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 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.



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

Continue...

**Complementary items to the standard supply**

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

**⑦ PLC-PI. PLC Module:**

Circuit diagram in the front panel.

Front panel:

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

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

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

**Analog inputs block:**

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

**Analog outputs block:**

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

**Touch screen:**

High visibility and multiple functions.

Display of a highly visible status.

Recipe function.

Bar graph function.

Flow display function.

Alarm list.

Multi language function.

True type fonts.

Back panel:

Power supply connector.

Fuse 2A.

RS-232 connector to PC.

Inside:

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

**Panasonic PLC:**

**High-speed scan of 0.32  $\mu$ 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).

**⑧ CFC/PLC-SOF. PLC Control Software:**

For this particular unit, always included with PLC supply.



PLC-PI

**Items available on request**

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

**⑩ CFC/FSS. Faults Simulation System.**

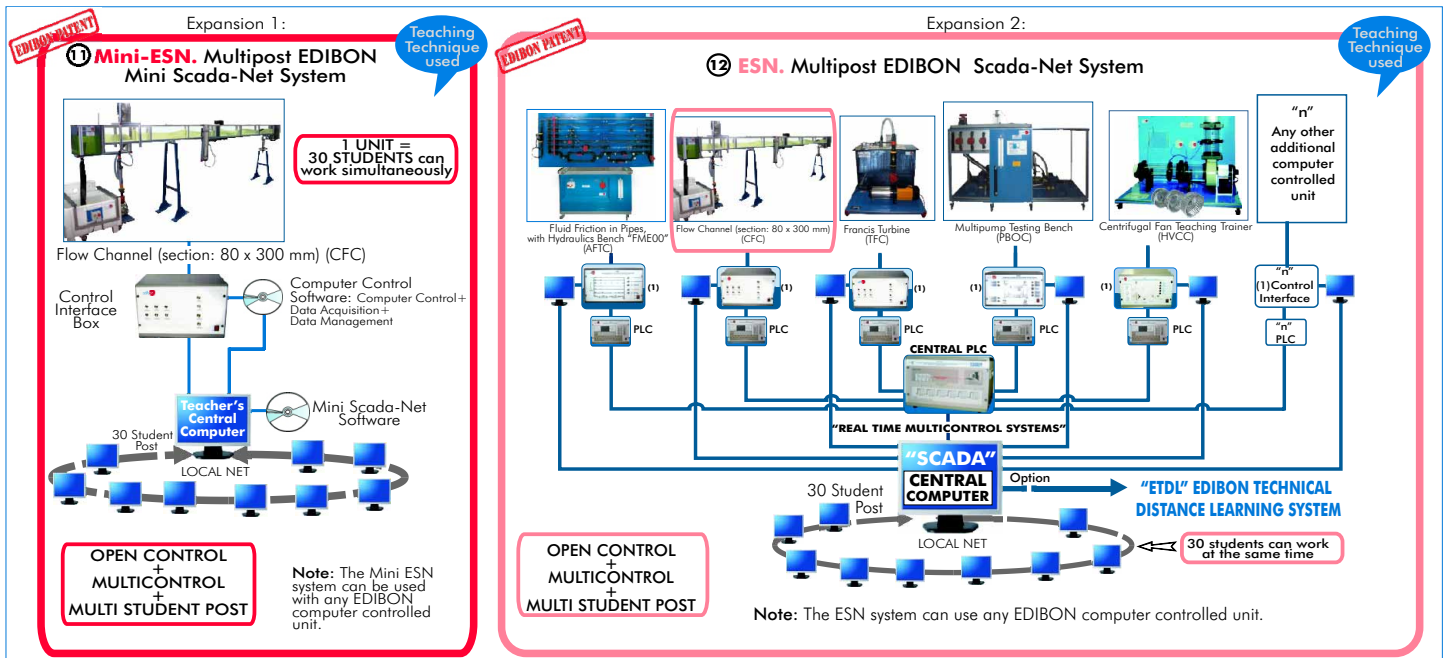


## EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit: (in function of the accessories used)

- 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.
- Other possible practices:
- 32.- Filling of the Pitot tube.
  - 33.- Filling of the venturi meter with analog output.
  - 34.- Calculation of water flow.
  - 35.- Use of level gauge for measurement of the water height.

## POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



## ORDER INFORMATION

### Items supplied as standard

Minimum configuration for normal operation includes:

- ① Unit: CFC. Computer Controlled Flow Channels (section: 80 x 300 mm).
  - Available versions to chose:
    - 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.

### Complementary items to the standard supply

- PLC. Industrial Control using PLC (7 and 8):
- ⑦ PCL-PI. PLC Module.
  - ⑧ CFC/PLC-SOF. PLC Control Software.
  - ⑨ CFC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request).
  - ⑩ CFC/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: 220V./50Hz or 110V./60Hz.
- Water supply and drainage.
- Computer (PC).

## DIMENSIONS & WEIGHTS

- |                        |   |
|------------------------|---|
| CFC80/2:               | -Dimensions: 3600 x 1000 x 1700 mm. approx.<br>-Weight: 250 Kg. approx. |
| CFC80/5:               | -Dimensions: 6050 x 1000 x 1700 mm. approx.<br>-Weight: 350 Kg. approx. |
| Control Interface Box: | -Dimensions: 490 x 330 x 310 mm. approx.<br>-Weight: 10 Kg. approx.     |

## AVAILABLE ACCESSORIES

- CFTPC. Pitot tube and manometer board.
- CFRMC. Level gauge for measurement of the water height (hook and point gauge).
- CFVDGC. Broad and thin crested weirs. (One broad weir and 2 thin weirs).
- CFCVRC. Vertical flat gate and radial gate.
- CFSDLC. Syphon spillway.
- CFPVPC. Dams spillway (3 different models) and flow splitters.
- CFCAC. Culvert fitting.
- CFVCC. Crump weir.
- CFVENC. Venturi flume.
- CFSDSC. Air regulated syphon.
- CFFSC. False floor sections. (2 different models).
- CFPLRC. Artificial roughened bed. (3 different models).
- CFTVCC. Venturi tube, with pressure transducers, converter and differential pressure digital indicator for input flow measurement.
- CFGOC. Wave generator.
- CFPRC. Adjustable undershot weir.

## 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.**

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



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