Flow Channels (section: 80 x 300 mm)

CF

Engineering and Technical Teaching Equipment

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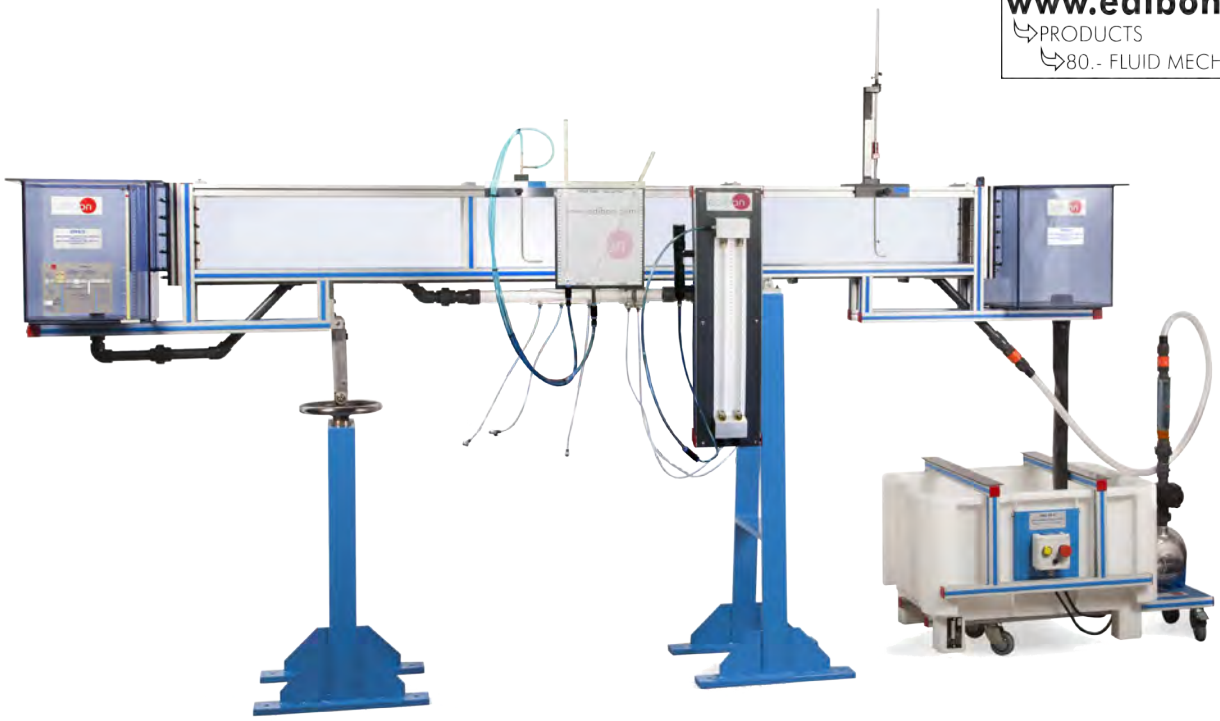
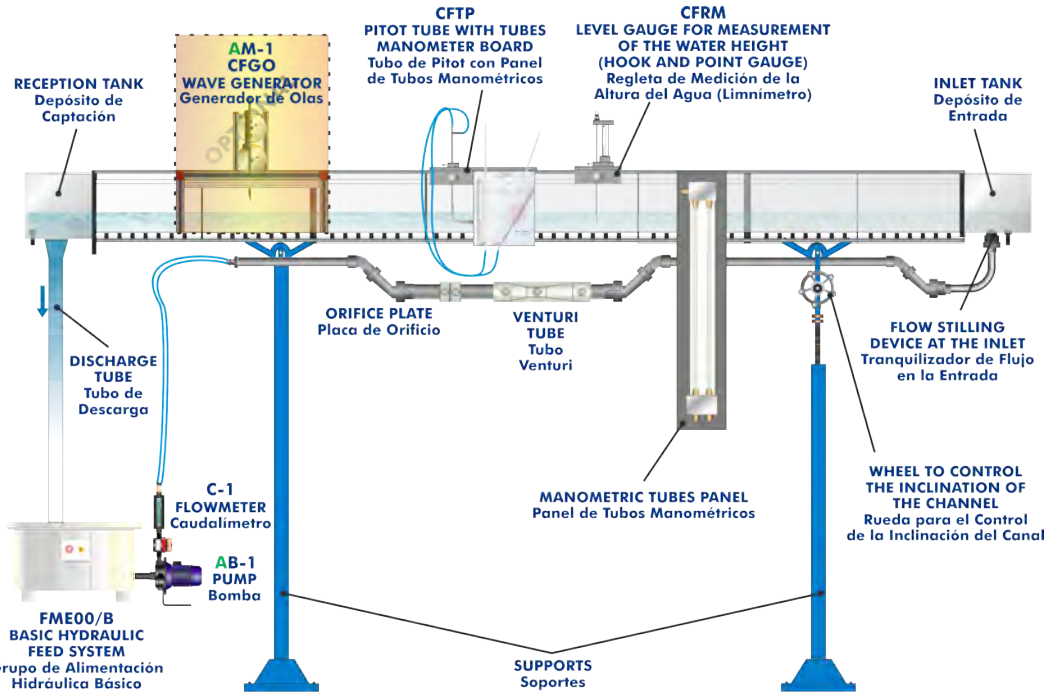
PRODUCTS
80.- FLUID MECHANICS



Available versions to choose:
- 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.

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



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 and, by the pipe, it is driven to the inlet tank, where there is a flow stilling device. 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.

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 flowmeter and a Venturi type flowmeter. The flow also can be measured with the flowmeter of the Basic Hydraulic Feed System (FME00/B).

A limnimeter (CFRM) is required to measure water level. Besides, a Pitot tube with tubes manometer board (CFTP) 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.

SPECIFICATIONS

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:

- 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.

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 flowmeter.

Venturi type flowmeter.

Manometric tubes panel. It is formed by two methacrylate tubes of 500 mm. of length, with a graduated panel and a hand pump.

FME00/B. Basic Hydraulic Feed System:

Storage tank (capacity: 140 l. approx).

Impulsion pump:

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.

Flowmeter, range: 600 - 6000 l./h.

Flow control valve.

Detail of CF

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

Models and Accessories required:

- CFRM. Level Gauge for Measurement of the Water Height (Hook and Point Gauge).
- CFTP. Pitot Tube with Tubes Manometer Board.

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.
- CFGO. Wave Generator.
- CFTS. Sediment Trap.

Models and Accessories required

CFRM. 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 "CFRM" accessory is an instrument formed by a probe tip in contact with water and the level is directly read in a graduated scale.

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.

CFTP. Pitot Tube with Tubes Manometer Board

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 "CFTP" 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 tubes manometer board where the total and static pressures are measured.

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.

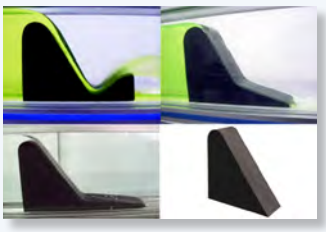
The "CFVC" accessory includes a critical weir made of PVC; it can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness. It has defined slopes upstream and downstream.

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.

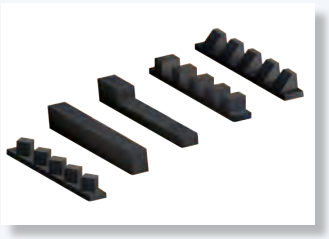
It can be fixed to any part of the bottom of the channel. It also has flexible lateral reinforcements to assure water-tightness.

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.

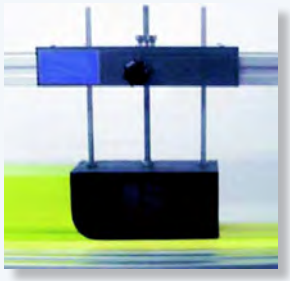
They can be fixed to any part of the bottom of the channel and has flexible lateral reinforcements to assure water-tightness.

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 (CFTP) or Venturi tube meter 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".

CFGO. Wave Generator

The "CFGO" 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 an electric console.

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

1.- Measurement of water level and speed along the channel.
2.- Flow rate measurement using sharp-crested weirs.
3.- Flow rate measurement through changes in the channel section.
4.- Flow rate measurement using Venturi flume.
5.- Flow rate control using gates.
6.- Level control using syphons.
7.- Flow over overflow weirs.
8.- Flow between the piers 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.-Manning coefficient calculation for channels with sedimentation.
13.-Comparison of the discharge coefficient in gates with or without sedimentation.
14.-Simulation of the effect of the piers of a bridge in a channel with sediments.
15.-Study of turbulences using ink.
16.-Visualization of the transitions of the sediments on the bed when abrupt discharges are generated.
17.-Dependence of the sediments shape on the flow rate variation.
18.-Study of the sediments transport and settling mechanisms.

Additional practical possibilities:

19.-Investigation of currents and torrential floods states.
20.-Water levels measurement.
21.-Discharge process in a submergible spillway.
22.-Pressure drop in open channels.
23.-Operation and study of a syphon.
24.-Flow and discharge coefficient of a syphon.
25.-Flow in pipes.
26.-Comparison between overflow and syphon.
27.-Study of the amplitude of the hydraulic jump.
28.-Generation of different flow states using an underwater dam.
29.-Study of the discharge processes under an adjustable weir:
- Study of alternating changes during the discharge.

30.-Relationship between backwater level and discharge level.
31.-Study of discharge under a radial gate:
- Study of alternating changes during the discharge.

32.-Hydrostatic pressure on a weir.
33.-Study of waves.
34.-Behaviour of structures under swell conditions (in rough sea).
35.-Application and understanding of Manning formula.
36.-Study of subcritical and supercritical flows.
37.-Learning how to apply the force, momentum and energy equations in typical situations.
38.-Study of the transition from flowing current to accelerated current.
39.-Calculation of the water flow.
40.-Use of the limnimeter. To determine the operating characteristics of a Francis turbine at different speeds.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

CF80/2:
-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.).

CF80/5:
-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.).

MODELS AND ACCESSORIES REQUIRED

- CFRM. Level Gauge for Measurement of the Water Height (Hook and Point Gauge).
- CFTP. Pitot Tube with Tubes Manometer Board.

OPTIONAL MODELS AND ACCESSORIES

- CFPR. Adjustable Undershot Weir.
- CFCVR. Vertical Flat Gate and Radial Gate.
- CFVD. Sharp Crested Weir.
- CFVG. Broad Crested Weir.
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- CFTVC. Differential Pressure Digital Indicator to Measure the Inlet Flow.
- CFAS. Sediment Feeder.
- CFGO. Wave Generator.
- CFTS. Sediment Trap.

AVAILABLE VERSIONS

Offered in this catalogue:

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

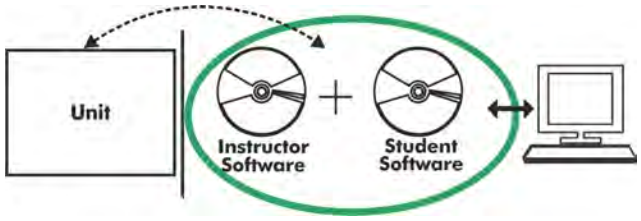
Offered in other catalogues:

- CFC80/2. Computer Controlled Flow Channel (section: 80 x 300 mm), lenght: 2.5 m.
- CFC80/5. Computer Controlled Flow Channel (section: 80 x 300 mm), lenght: 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), lenght: 12.5 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.

CF/ICAI. Interactive Computer Aided Instruction Software System:



Whit no physical connection between unit and computer, **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.

Instructor Software

-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 Workgroups, Tasks and Training sessions.

Creation and Integration of Practical Exercises and Multimedia Resources.

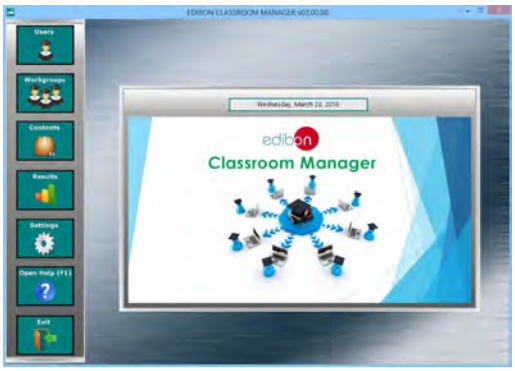
Custom Design of Evaluation Methods.

Creation and assignment of Formulas & Equations.

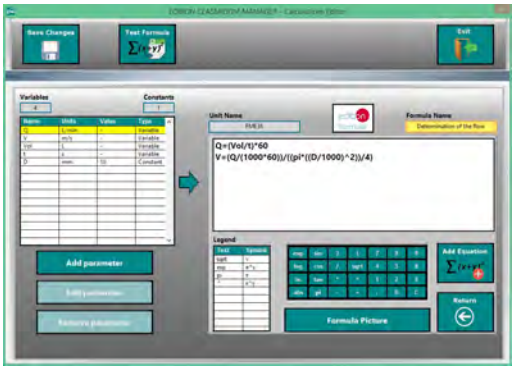
Equation System Solver Engine.

Updatable Contents.

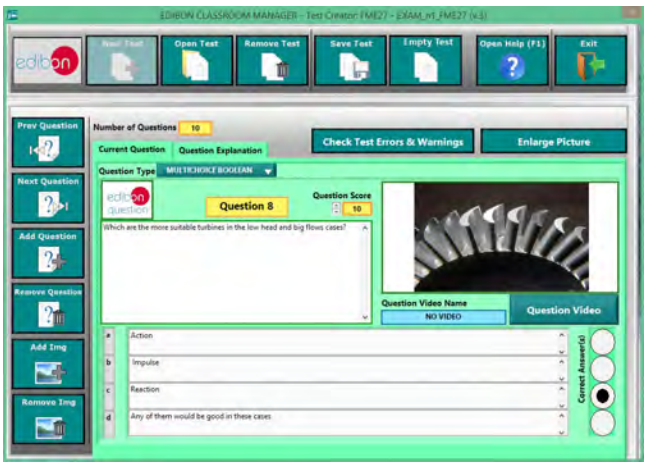
Report generation, User Progression Monitoring and Statistics.



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

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

Optional

Student Software

-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.

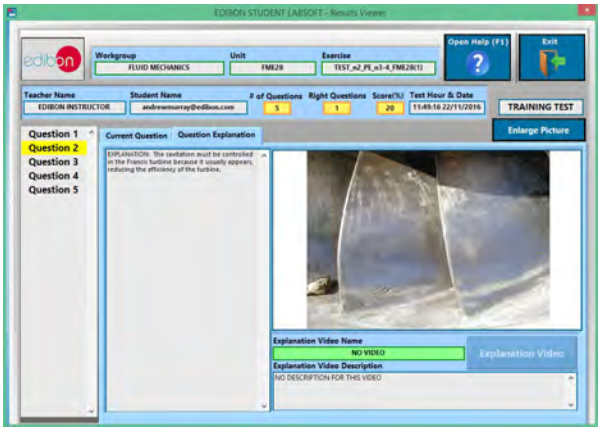
User Monitoring Learning & Printable Reports.

Multimedia-Supported auxiliary resources.

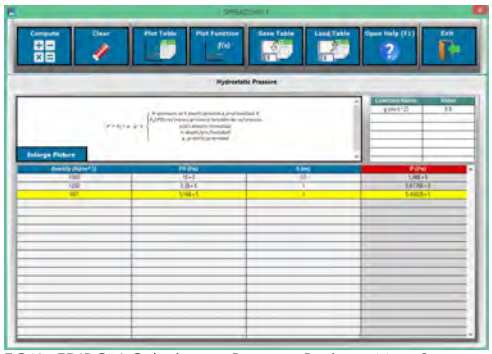
For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/products/catalogues/en/ICAI.pdf

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

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

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