

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

① Unit: BIETC. Computer Controlled Biomedical Electrotherapy Teaching Unit

Key features:

- **Advanced Real-Time SCADA based on LabVIEW.**
- **National Instruments Data Acquisition board (250 KS/s, kilo samples per second).**
- **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.**
- **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.**



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↳ PRODUCTS  
↳ 14.-BIOMEDICAL  
ENGINEERING

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

Bioelectricity is the branch of biology dealing with electric phenomena in plants and animals. It is especially important due to its direct relationship with nervous and muscle stimulus perception.

A stimulus is a detectable change in the environment. It is transmitted to and from cells by its transformation into an electric signal, which is processed by the corresponding control center. These stimuli cause the cells to move, secrete enzymes and hormones or produce certain genes.

One of the applications of this biological branch is the electrotherapy, which helps the movements of muscles by introducing electrical stimuli into the body. Another possible application deals with the temperature emitted by an electric device.

The Computer Controlled Biomedical Electrotherapy Teaching Unit, "BIETC", has been designed by EDIBON to study, in an experimental way, the low, medium and high frequency waves effects in human tissues and acquire the necessary knowledge to work with electrotherapy unit. It provides a safe environment to test these machines.

The unit is supplied with a set of practical exercises that will help the student to understand how the electrotherapy and electrosurgery units work.

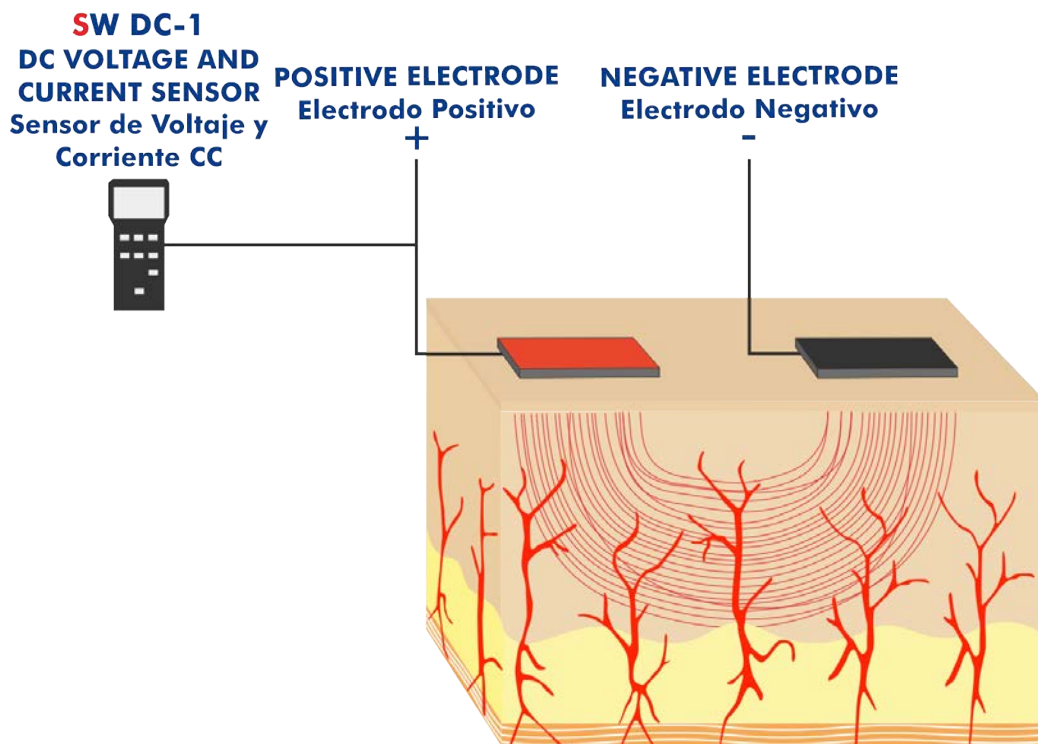
## GENERAL DESCRIPTION

The Computer Controlled Biomedical Electrotherapy Teaching Unit, "BIETC", consists of an electrotherapy machine used in a professional field.

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 + Data Acquisition and Data Management Software Packages, for controlling the process and all parameters involved in the process.

## PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION

### ELECTROTHERAPY Electroterapia



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 **BIETC. Unit:**

- Bench-top 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.
- The unit includes:

**Electrotherapy machine:**

- Twenty three different waveforms of low and medium frequency.
- Two independent output channels.
- Backlit LCD display.
- Adjustable treatment time between 1 and 99 minutes.
- Operation: continuous voltage and current.
- Maximum peak current: 100 mA.
- Risk class (93/42/CEE): IIB.

The complete unit includes as well:

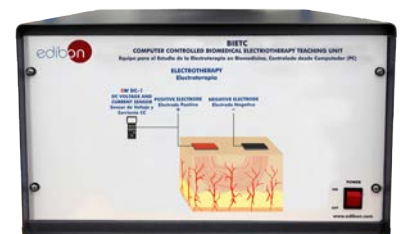
- Advanced Real-Time SCADA based on LabVIEW.**
- National Instruments Data Acquisition board (250 KS/s, kilo samples per second).**
- Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- Capable of doing applied research, real industrial simulation, training courses, etc.**
- 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: BIETC

② **BIETC/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.
- Simultaneous visualization in the computer of all parameters 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 sensors values and their responses are displayed on only one screen in the computer.
- Shield and filtered signals to avoid external interferences.**
- Three safety levels, one mechanical in the unit, another electronic in the control interface and the third one in the control software.**



BIETC/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 BIETC/CCSOF. Data Acquisition + Data Management Software:

The two 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 and open 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).**

**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 during the process, by using a projector or an electronic whiteboard.**



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

## EXERCISES AND PRACTICAL POSSIBILITIES TO BE DONE WITH THE MAIN ITEMS

- 1.- Study of the therapeutic applications of the electricity.
  - 2.- Understanding the different effects of the low and medium frequency currents in the human tissues.
  - 3.- Testing the effects of the electrotherapy waves according to the different factors involved in this type of therapy (frequency, tissues resistance, waveform, etc.).
  - 4.- Understanding different application examples: iontophoresis, ease pain, etc.
- Other possibilities to be done with this Unit:
- 5.- Many students view results simultaneously.  
To view all results in real time in the classroom by means of a projector or an electronic whiteboard.
  - 6.- The Computer Control System with SCADA allows a real industrial simulation.
  - 7.- This unit can be used for giving training courses to Industries even to other Technical Education Institutions.
  - 8.- Visualization of all the sensors values used in the BIETC unit process.
- Several other exercises can be done and designed by the user.

### REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- Computer.

### DIMENSIONS AND WEIGHTS

#### BIETC:

##### Unit:

- Dimensions: 1000 x 700 x 500 mm approx.  
(39.37 x 27.56 x 19.66 inches approx.).
- Weight: 20 kg approx.  
(44 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.)

## COMPLETE TECHNICAL SPECIFICATIONS (for optional items)

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) Technical and Vocational Education configuration

#### ⑦ BIETC/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.

#### - 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/en/files/expansion/ICAI/catalog](http://www.edibon.com/en/files/expansion/ICAI/catalog)

### Instructor Software



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

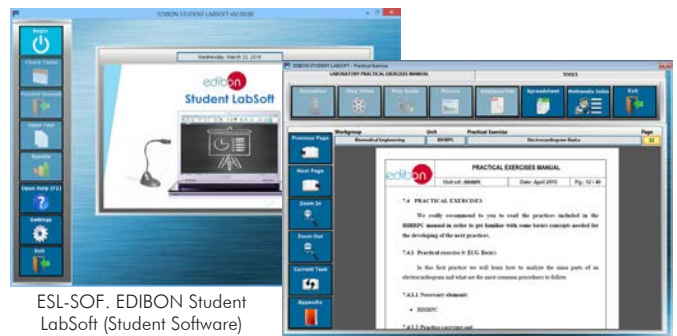
ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

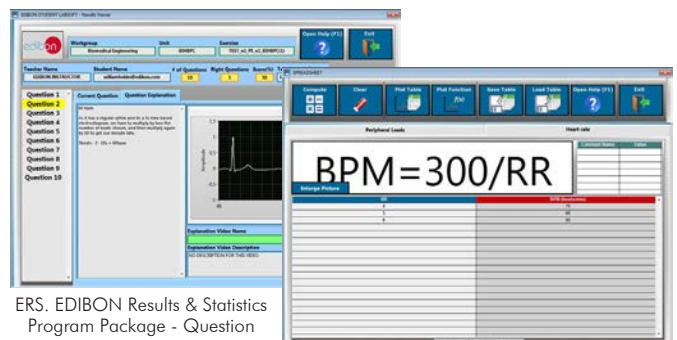
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

### 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

**⑧ BIETC/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.

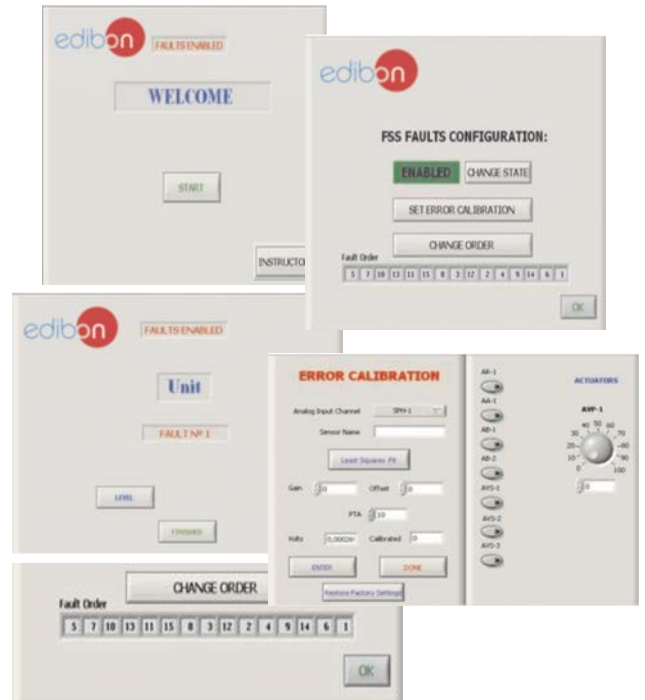
Faults in the controls execution:

- 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.

Example of some screens



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

[www.edibon.com/en/files/expansion/FSS/catalog](http://www.edibon.com/en/files/expansion/FSS/catalog)

b) Multipost Expansions options

**⑨ MINI ESN. EDIBON Mini Scada-Net System for being used with EDIBON Teaching Units.**

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:

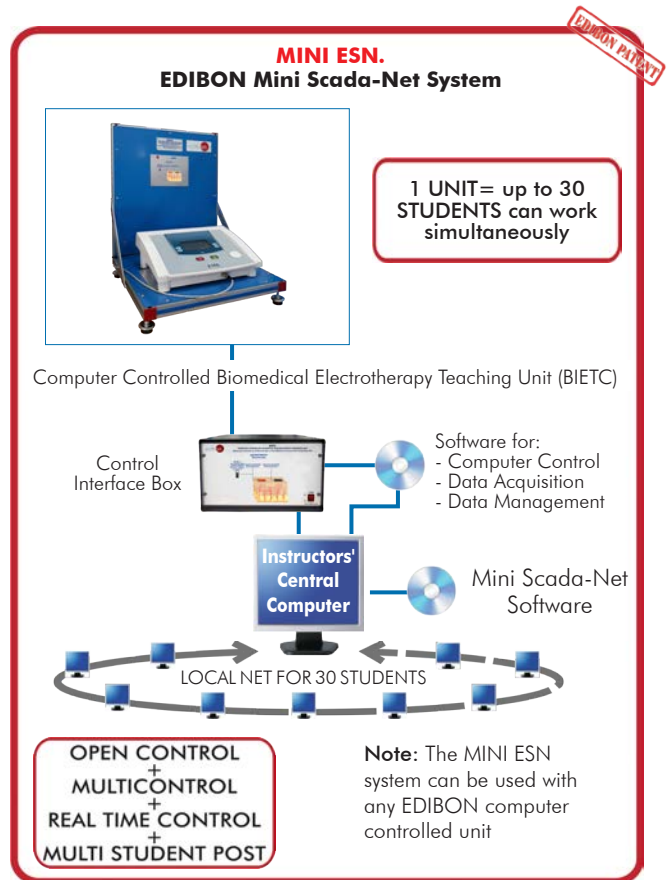
[www.edibon.com/en/files/expansion/MINI-ESN/catalog](http://www.edibon.com/en/files/expansion/MINI-ESN/catalog)

**⑩ ESN. EDIBON Scada-Net Systems.**

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/en/files/expansion/ESN/catalog](http://www.edibon.com/en/files/expansion/ESN/catalog)



## ORDER INFORMATION

### **Main items** (always included in the supply)

Minimum supply always includes:

- ① **Unit: BIETC. Computer Controlled Biomedical Electrotherapy Teaching Unit.**
- ② **BIETC/CIB. Control Interface Box.**
- ③ **DAB. Data Acquisition Board.**
- ④ **BIETC/CCSOF. Data Acquisition + Data Management Software.**
- ⑤ **Cables and Accessories**, for normal operation.
- ⑥ **Manuals.**

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

### **Optional items** (supplied under specific order)

#### a) Technical and Vocational Education configuration

- ⑦ BIETC/ICAI. Interactive Computer Aided Instruction Software System.
- ⑧ BIETC/FSS. Faults Simulation System.

#### b) Multipost Expansions options

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 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 BIETC/CCSOF. Data Acquisition+Data Management Software:**

The two softwares are part of the SCADA system.  
 Compatible with the industry standards.  
 Flexible and open software, developed with actual windows graphic systems, acting simultaneously on all process parameters.  
 Management, processing, comparison and storage of data.  
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### **Exercises and Practical Possibilities to be done with the Main Items**

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- 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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