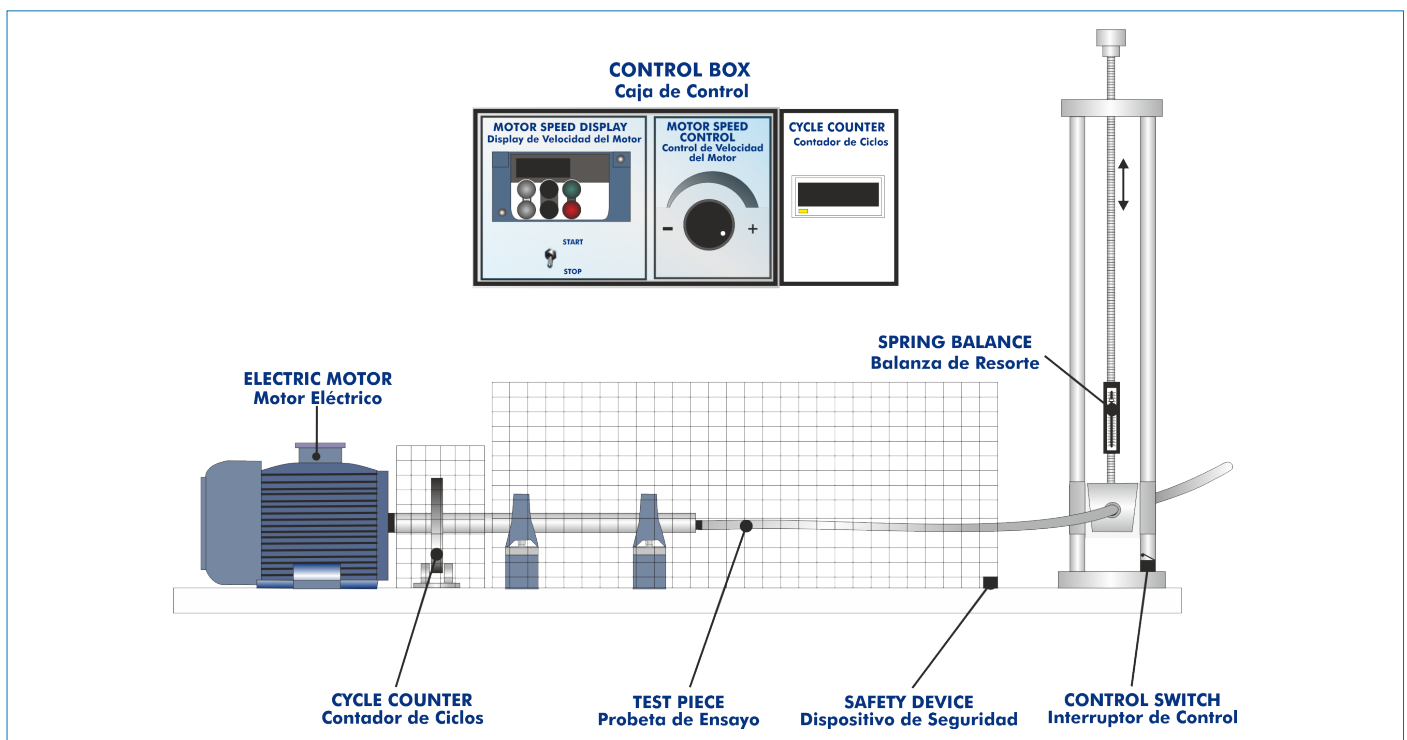




## PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



## INTRODUCTION

Fatigue is defined as the process of a localized, permanent and progressive structural change suffered by a material subjected to some conditions that cause stress and deformations in one or several points. It can lead to the appearance of cracks or to breakage after a sufficient number of fluctuations.

Fatigue is a way of breakage that occurs in structures subjected to dynamic and fluctuating stresses (bridges, automobiles, planes, etc.). Its main danger is that it can occur at a stress minor than the tensile strength or the elastic limit for static load and appear without notice, causing catastrophic breakages.

Fatigue testing devices are frequently used in industry, since they enable to know the fatigue limit of each material, very important in structural materials, where a great knowledge of the mechanical properties of the material is required.

## GENERAL DESCRIPTION

The Fatigue Testing Unit, "EEF", designed by EDIBON, allows to study the fatigue strength of the materials. For that purpose, fatigue tests are performed with different materials and notches.

Optionally, with the additional recommended element Set of Small Specimens, "EEF-SSP", it is possible to study the influence of different rounding radii and surface qualities on fatigue strength. **(\*) Check price and delivery time (\*)**.

The Fatigue Testing Unit, "EEF", can be compatible with all available specimen sizes. **(\*) Check price and delivery time (\*)**.

An electric motor is fixed to the lower panel of the unit. One end of the test piece is joined to the motor shaft by a coupling. A disc which will count the number of rotations of the motor thanks to a device is also coupled to the shaft.

On the right side of the panel, it is placed the system with which the test piece is loaded. This system, with a spring balance, is joined to a threaded spindle by its upper end, while on its lower side it is joined to an articulated guided system to which the right end of the test piece is held. When turning the threaded spindle clockwise, an upward vertical force is transmitted to the test piece. The applied force can be measured with the spring balance.

In order to guarantee the force verticality, the system has two guides to avoid horizontal displacements during the transmission of stress.

Likewise, in order to assure the constant application of the load, besides of allowing the test piece rotation on its axial symmetry axis, the system also allows the alignment of the coupling with the test piece, due to the bending deformation it suffers.

Both the area where the test piece is located and the motor axis output are covered with a protection cage, without it the unit does not work, since it is provided with a safety system to avoid accidents.

Besides, it includes a control switch that detects when the test piece is broken and switches off the motor right away.

The unit control box is mounted on the upper panel, containing: the main (ON/OFF) switch of the unit, the cycle counter that shows us the quantity of turns the motor shaft carries out, the motor's speed control that allows us to increase or decrease the turning speed of the electric motor, the motor speed display that shows the motor speed and the on/off switch of the electric motor.

The Fatigue Testing Unit, "EEF", is an autonomous unit with its control box, being able to be connected to a computer with the additional recommended element Software, Sensors and Control for EEF Unit, "EEF-SSC", allowing the acquisition of the measurements made.

## SPECIFICATIONS

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 "EEF" unit mainly consists of:

Electric motor of 0.37 kW, maximum speed: 3000 rpm.

Motor speed control by a frequency regulator.

Loading device with spring balance (0 – 30 kg) and adjustment using threaded spindle with hand wheel between 0 and 300 N at the cantilever end of the test pieces.

Test pieces with a diameter of 8 mm and a length of 380 mm:

Two AISI 304L Stainless steel cylindrical test pieces.

Six AISI 304L Stainless steel cylindrical test pieces, with different notches.

Two F-1 Carbon steel cylindrical test pieces.

Six F-1 Carbon steel cylindrical test pieces, with different notches.

Two F-212 Steel cylindrical test pieces.

Six F-212 Steel cylindrical test pieces, with different notches.

The unit includes all the safety measures required for a safe operation:

Metallic protection cages, a fixed one for the motor axis outlet and a removable one for the test piece zone; without it the unit does not work, since it has a safety system to avoid accidents.

Automatic shut down in case of test piece breakage by stop switch (control switch).

Control box, including:

ON/OFF Main switch of the unit.

ON/OFF Switch of the electric motor.

Cycle counter, with digital display.

Motor speed controller.

Motor speed digital display.

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.

Additional recommended elements (Not included):

- EEF-SP. Set of Spare Parts of Standard Specimens.
- EEF-SSP. Set of Small Specimens. (\*) **Check price and delivery time (\*)**.
- EEF-SSC. Software, Sensors and Control for EEF Unit.



EEF detail

### Additional recommended elements (Not included)

#### **EEF-SP. Set of Spare Parts of Standard Specimens**

Test pieces with a diameter of 8 mm and a length of 380 mm:

- Two AISI 304L Stainless steel cylindrical test pieces.
- Six AISI 304L Stainless steel cylindrical test pieces, with different notches.
- Two F-1 Carbon steel cylindrical test pieces.
- Six F-1 Carbon steel cylindrical test pieces, with different notches.
- Two F-212 Steel cylindrical test pieces.
- Six F-212 Steel cylindrical test pieces, with different notches.

#### **EEF-SSP. Set of Small Specimens**

Twelve cylindrical test pieces with a diameter of 8 mm in the test area (length: 106 mm), 12 mm in the clamping area (length: 41 mm) and 147 mm in total length. They have three different types of roundness:

- Three steel test pieces with the shaft shoulder between the test area and the clamping area of radius of 0.5 mm and surface quality of Rz 4.
- Three test pieces made of steel with the shaft shoulder between the test area and the clamping area of radius of 1 mm and surface quality of Rz 4.
- Three test pieces made of steel with the shaft shoulder between the test area and the clamping area of radius 2 mm and surface quality of Rz 4.
- Three test pieces made of steel with the shaft shoulder between the test area and the clamping area of radius 2 mm and surface quality of Rz 25.

**(\*) Check price and delivery time (\*).**

#### **EEF-SSC. Software, Sensors and Control for EEF Unit**

The Software, Sensors and Control for EEF Unit, "EEF-SSC", is a set that allows the acquisition of the measurements of fatigue tests to rotary bending with cantilevered piece in a computer.

For the acquisition a load cell is included, coupled to the load system, which will measure the force applied to the piece (0 – 50 kg). The speed measurement will also be monitored by the computer.

It can be used on both a laptop and a bench-top unit.

The system is mainly formed:

- Control Interface Box with process diagram on the front panel. It includes:
  - Data Acquisition Board. USB connection.
  - External signal amplifier/adaptor (load cell and tachometer).
- Control Software + Data Acquisition + Data Management; allows:
  - Recording, manipulation, comparison and storage of data.
  - Acquisition and storage of bending force values and specimen speed from the computer.
  - Representation of Wöhler diagrams.
  - Optional electric motor control.



## EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Determination of the basic principles of fatigue strength testing.
- 2.- Influence of the material on fatigue strength.
- 3.- Influence of the notch effect on fatigue strength.
- 4.- Influence of the length of the notch on fatigue strength.
- 5.- Representation of Wöhler fatigue strength S-N curves.
- 6.- Physical analysis of the regions formed in the rupture of pieces in the fatigue test.
- 7.- Influence of different rounding radii and qualities of surface on fatigue strength (requires the additional recommended element "EEF-SSP").

### REQUIRED SERVICES

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

### DIMENSIONS AND WEIGHTS

- EEF:
- Dimensions: 1000 x 600 x 600 mm approx.  
(39.37 x 23.62 x 23.62 inches approx.)
  - Weight: 52 kg approx.  
(114 pounds approx.)

### ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- EEF-SP. Set of Spare Parts of Standard Specimens.
- EEF-SSP. Set of Small Specimens. (\*) **Check price and delivery time (\*)**.
- EEF-SSC. Software, Sensors and Control for EEF Unit.

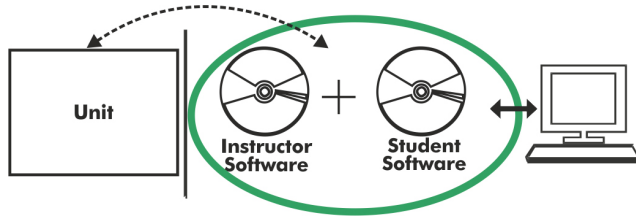
### SIMILAR UNITS AVAILABLE

- EEF. Fatigue Testing Unit.

Offered in this catalog:

Offered in other catalog:

- EEFC. Computer Controlled Fatigue Testing Unit.

**EEF/ICAI. Interactive Computer Aided Instruction Software:**

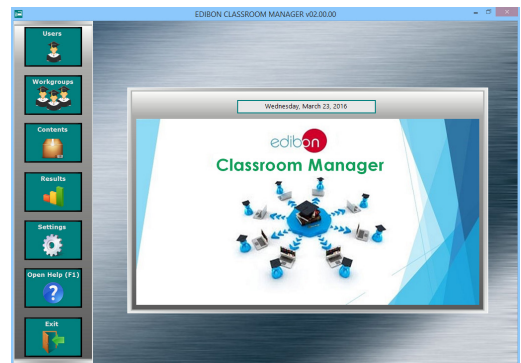
With no physical connection between unit and computer, this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

Instructor Software**- ECM-SOF. EDIBON Classroom Manager (Instructor Software).**

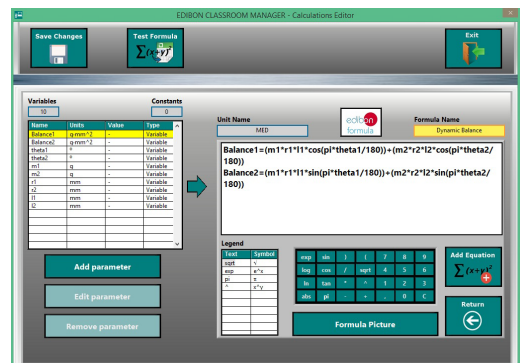
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

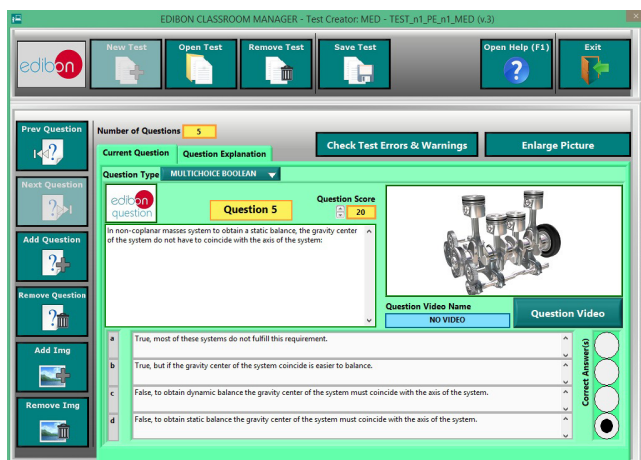
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- Updatable Contents.
- Report generation, User Progression Monitoring and Statistics.



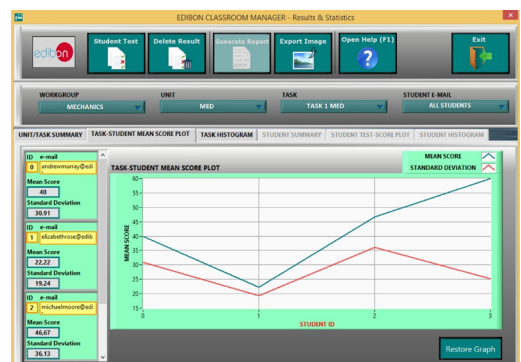
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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).

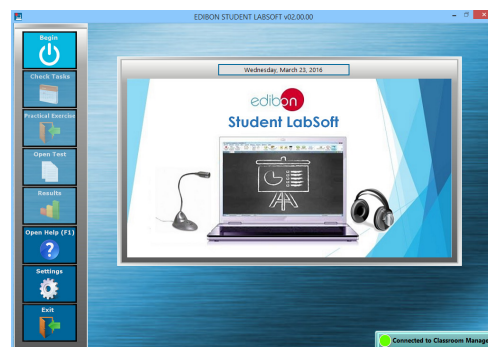
ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are 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:

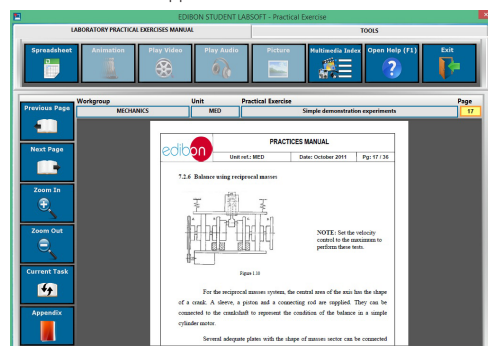
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- 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:

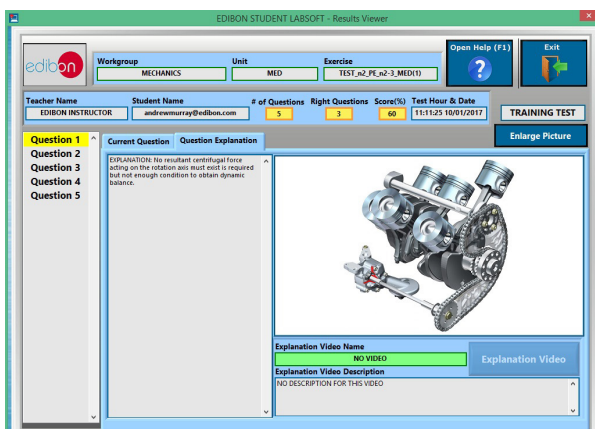
[www.edibon.com/en/interactive-computer-aided-instruction-software](http://www.edibon.com/en/interactive-computer-aided-instruction-software)



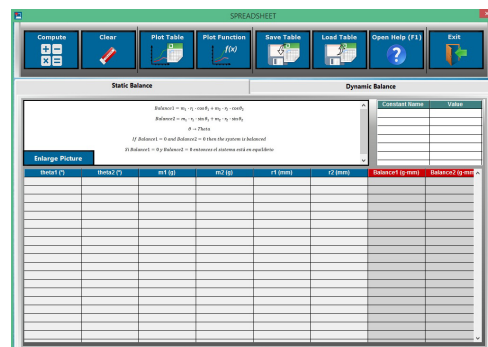
ESL-SOF. EDIBON Student LabSoft (Student Software)  
Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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



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Edition: ED01/23  
Date: November/2023

REPRESENTATIVE:

