Universal Buckling Unit

MUP

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INTRODUCTION

Buckling is a phenomenon of structural instability in which struts are subjected to compression and on which a disturbing force acts.

Buckling, as opposed to simple strength problems such as drawing, pressure, bending and shearing, is primarily a stability problem. Buckling problems number among the best known technical examples in stability theory.

Buckling plays an important role in almost every field of technology. Examples of this are:

- Struts and supports in construction and steel engineering.
- Stop rods for valve actuation and connecting rods in motor construction.
- Piston rods for hydraulic cylinders.
- Lifting spindles in lifting gear.

All parts subjected to pressure are susceptible to buckling.

The main characteristic of the struts which can experiment buckling is the slenderness, that is to say, the struts must be long enough in relation to their thickness in order for the mentioned effect to occur.

The Universal Buckling Unit "MUP" is a unit designed by EDIBON to demonstrate the concept of buckling for struts, that allow to determine experimentally the relation between the buckling load and the methods of support of the test bars, different thickness and different shapes of the test bars.

GENERAL DESCRIPTION

The Universal Buckling Unit "MUP" is a bench-top unit whose frame is made of anodized aluminum profiles and plates and steel elements, on which a bubble level is installed to equilibrate the system.

The unit has been designed to carry out tests with different lengths and different methods of support:

- Both ends pinned.
- Both ends fixed.
- One end fixed and the other pinned.

This unit is designed to work with two types of bars: of circular section and rectangular section. Therefore, the experiments can be carried out according to the different methods of support and different lengths, between 400 mm and 800 mm.

The unit has a regulation nut which, together with a bubble level, will allow to equilibrate the horizontal lower supports, all that after having subjected the system to compression.

It has an accessory to create the instability of the system to study, which consists of a pulley and its support to hang a masses. This accessory can change the disturbing force which acts on a vertical bar subjected to compression.

A digital balance installed in the right side portico will allow to know the load at which the test bar is subjected.

To obtain the experimental test bar deflection, with respect to the vertical, a dial gauge is supplied.

SPECIFICATIONS

Bench-top unit with adjustable legs.

Anodized aluminum frame and panels in painted steel.

The MUP unit basically consists of:

Two porticoes:

- A 1 m. height portico, where the test bars are placed. It is designed to accommodate bars of different height by using two pins. Besides, at the upper and lower parts there are special clamps to subject the bar to the desired methods of support.
- A 50 cm. height portico, where the test bar will be subjected to load by turning a hand operated spindle, which will tend to elevate the lower support, so the test bar will be subjected to compression.

MUP detail

Bubble level to equilibrate the system.

Regulation nut which together with a bubble level will allow to equilibrate the horizontal lower supports.

Digital balance of 0-50 kg to measure the bar compression load, with 100 g accuracy.

Weight of 2 kg.

Dial gauge, measurement range: 0-20 mm, precision: 0.01 mm, to check the bar flexion as the test bar is subjected to load.

Accessory to create disturbing load over the test bar, which consists of support and pulley.

Set of test bars, composed of:

- 15 bars of rectangular section of different lengths and different methods of support.
- 15 bars of circular section of different lengths and different methods of support.

In order to carry out some of the practices with MUP unit, an "A Type" Set of weights is required. (See "Required Accessories" section).

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

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of Euler buckling theory.

2.- Experimental determination of the relation between the buckling load for different thickness and shapes of the test bars.

3.- Experimental determination of the relation between the buckling load and the methods of support of the test bars.

4.- Determination of the critical load differences for different lengths and different bar sections.

5.- Measurement of lateral deflection.

REQUIRED ACCESSORIES (Not included)

- 1 "A Type" Set of weights. Each "A Type" Set includes:

  5 weights of 50gr. (0.11 pounds).

  4 weights of 10 gr. (0.022 pounds).

  1 support hook (hunger) of 50 gr. (0.11 pounds).

DIMENSIONS AND WEIGHTS

MUP:

Unit:

-Dimensions: 800 x 500 x 1200 mm. approx.

(31.49 x 19.68 x 47.24 inches approx.).

-Weight: 65 Kg. approx.

(143 pounds approx.)

Case for accessories:

-Dimensions: 350 x 300 x 150 mm. approx.

(13.78 x 11.81 x 5.9 inches approx.).

MUP/ICAI. Interactive Computer Aided Instruction Software System:
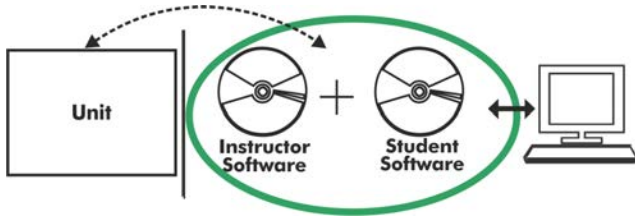
With no physical connection between unit and computer (PC), **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF)**. Both are interconnected so that the teacher knows at any 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.

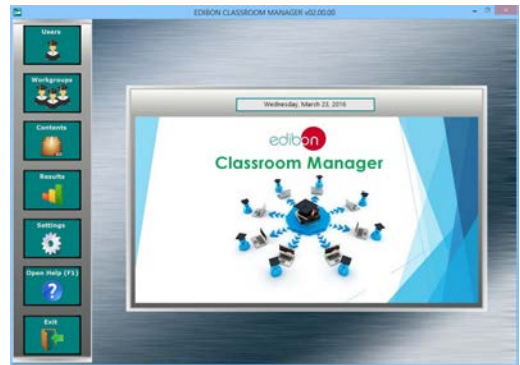Creation and Integration of Practical Exercises and Multimedia Resources.

Custom Design of Evaluation Methods.
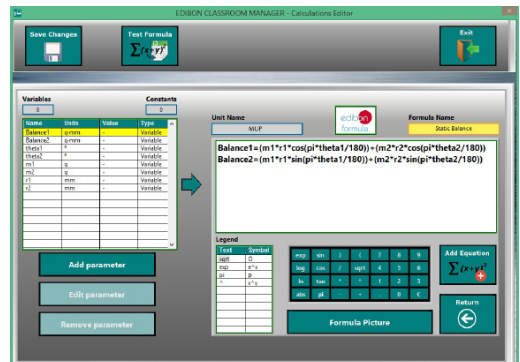
Creation and assignment of Formulas & Equations.
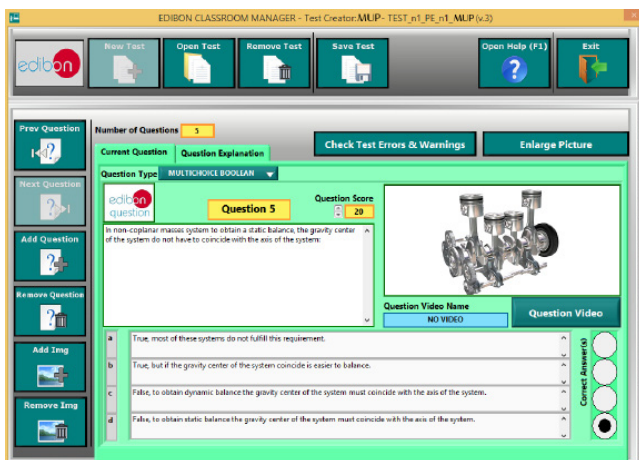
Equation System Solver Engine.

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

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.

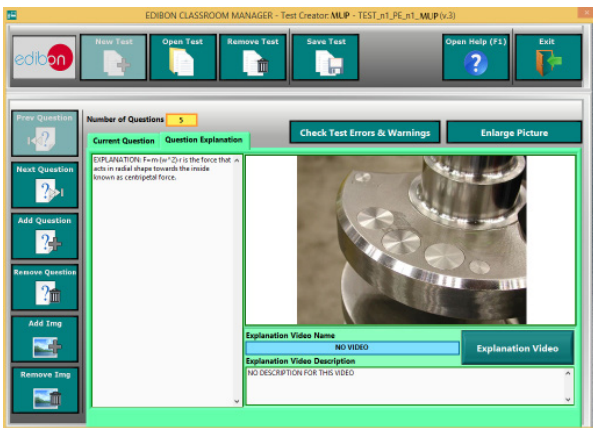For more information see **ICAI** catalogue. Click on the following link:

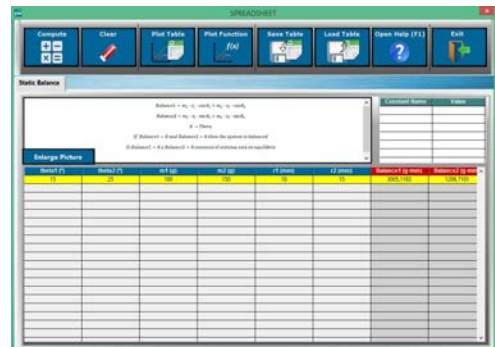**www.edibon.com/products/catalogues/en/ICAI.pdf**

ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
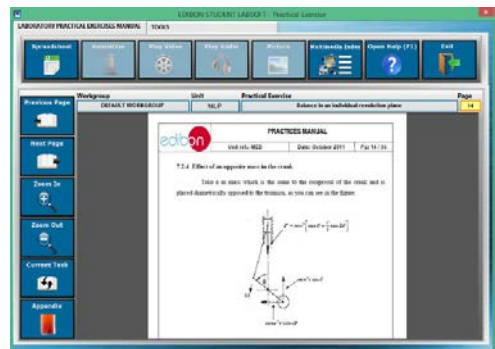
EPE. EDIBON Practical Exercise Program Package Main Screen

ERS. EDIBON Results & Statistics Program Package-Question Explanation

ECAL. EDIBON Calculations Program Package Main Screen

BDAS. Basic Data Acquisition System and Sensors.
For being used with mechanical modules.
BDAS is designed to monitor the measurements of each mechanical module from a computer (PC).

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

INTERNATIONAL

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REPRESENTATIVE: