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Technical Teaching Equipment

Parabolic Arch Unit

MARP

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INTRODUCTION

The parabolic arch is a structural element in architecture and civil engineering, whose functions are covering openings and supporting loads, as well as being an aesthetic element.

If the geometry of the arch is suitable, it supports great transverse loads and transmits them to the external supports, basically working under compression, with little bending stress.

The Parabolic Arch Unit "MARP" allows to study an isostatic (or statically determinate) parabolic arch (having one fixed support and one movable support) or a hyperstatic (or statically indeterminate) parabolic arch (having both supports fixed) under load, the deformations generated and the reactions of the supports of the arch.

GENERAL DESCRIPTION

The Parabolic Arch Unit "MARP" contains a pre-shaped articulated arch, which can be subjected to point or evenly distributed loads by means of seven uniformly distributed cables (cords) with hangers.

One support of the arch is fixed whereas the other support can be fixed or movable in horizontal direction. When both supports are fixed, the hyperstatic arch conditions will be studied (1 degree of freedom); whereas if one of the supports is movable, the isostatic arch conditions will be analyzed (0 degrees of freedom).

To fix the movable support, so that it works as a fixed support, a set of weights is used to cancel out the horizontal displacement and another set of weights to balance the vertical reaction of the support.

To measure the deformation of the arch under load the unit has two dial gauges, one that measures the horizontal displacement of the free support and another that measures the bending of the arch.

SPECIFICATIONS

The unit includes:

Frame, of anodized aluminum, with measurement system to level the ends of the parabolic arch.

Parabolic arch made of tempered steel with 7 cords with hangers to hang the weights from them (uniformly distributed load or point load):

Length: 500mm.

Height: 200mm.

Cross section: 20 x 1.5mm.

Support systems:

Fixed end.

Movable end that moves horizontally along a guide. This end can be transformed into a fixed end.

3 pairs of pulleys that allow to lodge the weights required for:

To cancel out the horizontal displacement and to fix the movable support.

To compensate the vertical reaction of the support.

2 dial gauges, range: 0-25mm. Precision: 0.01mm.

Set of weights:

Weights to apply load on the parabolic arch:

7 hangers of 100 gr.

7 weights of 100 gr.

7 weights of 50 gr.

Weights to compensate the reactions in the fixed support:

4 hangers of 100 gr.

13 weights of 100 gr.

13 weights of 50 gr.

Storage cage, with packing foam, for the weights and hangers.

Manuals: This unit is supplied with the following manuals: Required services, Assembly and Installation, Starting-up, Security, Maintenance and Practices manual.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of the mechanical principles of a parabolic arch.

2.- Differences between an isostatic arch and a hyperstatic arch.

3.- Analysis of the arch under load:

Measurement of the deformations.

Measurement of the reactions of the supports in the hyperstatic arch.

4.- Influence of a point load or an evenly distributed load on the reactions at the support and on the deformation of the arch.

5.- Evaluation of the relation between applied load and horizontal displacement.

6.- Comparison of the horizontal displacement with theoretical values.

7.- Analysis of the horizontal thrust.
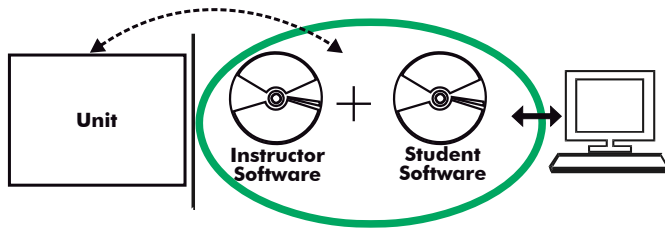
DIMENSIONS & WEIGHTS

MARP:

Unit:
-Dimensions: 850 x 400 x 700 mm. approx. (33.46 x 15.74 x 27.56 inches approx.).
-Weight: 30 Kg. approx. (66 pounds approx.)

Storage case for the weights and hangers: -Dimensions: 350 x 300 x 150 mm. approx. (13.78 x 11.81 x 5.9 inches approx.).
-Peso: 5 Kg. approx. (11 pounds approx.)

MARP/CAI. Computer Aided Instruction Software System:

With no physical connection between unit and computer (PC), **this complete software package consists of an Instructor Software (INS/SOF) totally integrated with the Student Software (MARP/SOF).** Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

Example of software screens

<u>Instructor Software</u>

INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.

- Create easily new entries or delete them.

- Create data bases with student information.

- Analyze results and make statistical comparisons.

- Generate and print reports.

- Detect student's progress and difficulties.

   …and many other facilities.
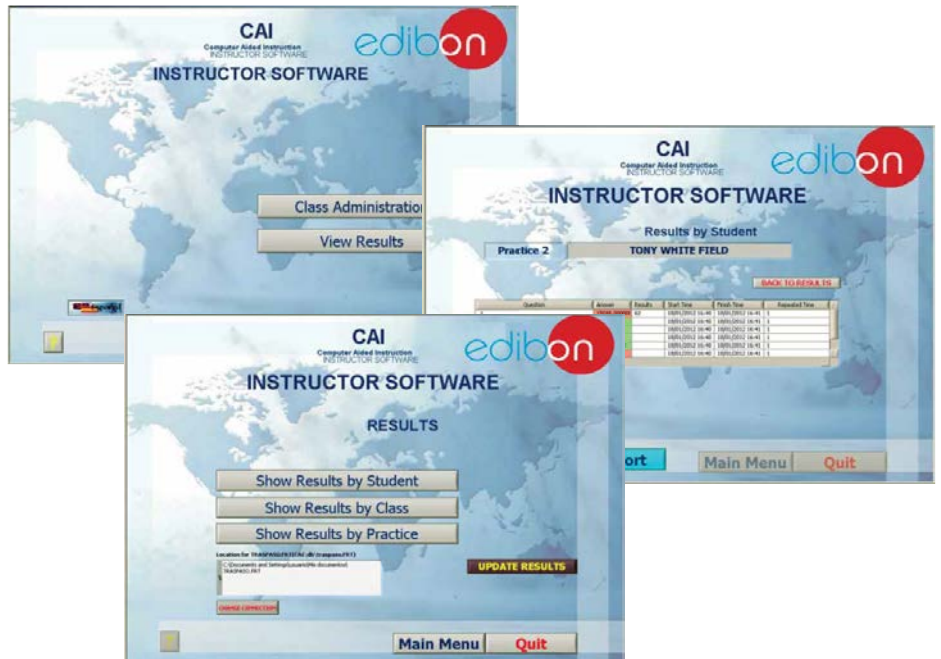
This software, working in network configuration, allows controlling all the students in the classroom.

<u>Student Software</u>

MARP/SOF. Computer Aided Instruction Software (Student Software).

It explains how to use the unit, run the experiments and what to do at any moment.

- This software contains:

   Theory: gives the student the theoretical background for a total understanding of the studied subject.

   Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

   Guided Practices: presents several practices to be done with the unit, showing how to perform the exercises and practices.

   Exams: set of questions to test the obtained knowledge.

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

www.edibon.com/products/catalogues/en/CAI.pdf

MARP/CAL. Computer Aided Learning Software (Results Calculation and Analysis):

This Computer Aided Learning Software (Results Calculation and Analysis) "CAL" is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in doing the necessary calculations to extract the right conclusions from data obtained during the experimental practices. With a single click, CAL computes the value of all the variables involved and performs the calculations.

Also, CAL allows to plot and print the results. Within the plotting options, any variable can be represented against any other.

Available different plotting displays.

It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

On a table, we introduce data obtained during the development of the exercise.

Above this table, it is shown "Constants" theoretically involved with the field of study. The values of these "Constants" may be modified to our convenience, assigning the appropriate values.

Simply, by clicking on "COMPUTE", CAL performs the calculations of the desired variables.

We can save and print the data of the experiment or calculations.

Also we can load any data file saved previously.

With the calculated variables, CAL gives the option of plotting the results. It is possible to represent any variable against any other. It has the option of representing the graph with different layouts. Screens below give an example of the multiple choices.

CAL has a wide range of help information. By clicking the button "ADDITIONAL HELP" opens a window where we have information about typical Constants, International System Units, Conversion Factors, and Table of Main Integrals and Derivatives (General), and there is other specific help for the particular unit.

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

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

REPRESENTATIVE: