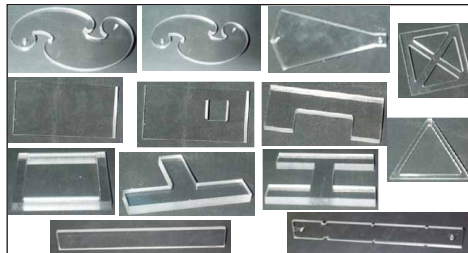


## Test Specimens

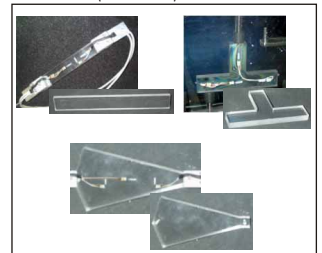
EFO-K1. Kit of Static Test Specimens (basic kit)



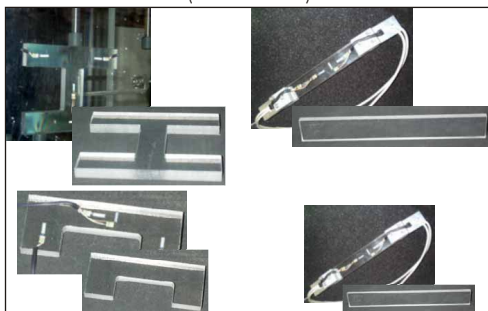
EFO-K2. Kit of Static Test Specimens (advanced kit)



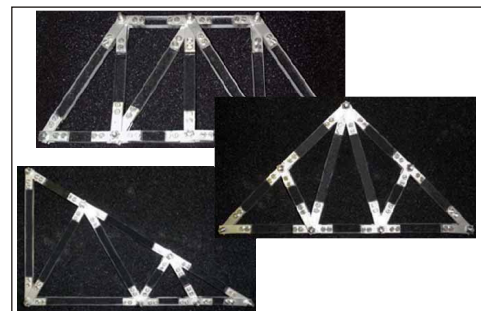
EFO-K3. Kit of Test Specimens with Strain Gauges (basic kit)



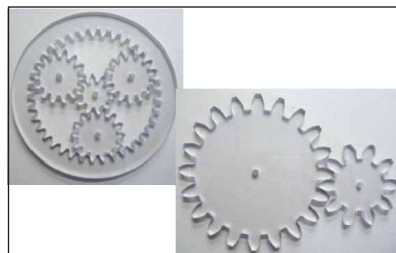
EFO-K4. Kit of Test Specimens with Strain Gauges (advanced kit)



EFO-K5. Kit of Articulated Structures



EFO-K6. Kit of Dynamic Panels



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(for Design, Manufacturing,  
Commercialization and After-sales service)



European Union Certificate  
(total safety)



Certificates ISO 14000 and  
ECO-Management and Audit Scheme  
(environmental management)



Worlddidac Quality Charter  
Certificate  
(Worlddidac Member)

## INTRODUCTION

Photoelasticity is the method of analysing and recording mechanical stresses and strains in components.

The components used are test specimens or models made of transparent special material which becomes optically double-refractive under mechanical loading.

Using polarised light, the distribution of stress in test specimens is investigated.

The polarisation filters represent the distribution of stress in colours.

By using white or monochromatic light and different configuration of linear and circular polarizer / analyzer we can obtain the principal stresses direction and the principal stresses difference.

By using strain gauges we can measure the stress in a certain position and in one direction. With Photoelasticity we can observe the value in the whole element and in all directions.

## GENERAL DESCRIPTION

Unit for photoelasticity practices, illustrating the subjects of the Photoelasticity theory, the Elasticity theory, Strength of Materials, and Structure theory.

It is very suitable for the introduction and study of photoelasticity: optical elements, isochromatic, isoclinic, band order, band factor, edge tensing, and for strain and stress analysis and measurement with strain gauges.

With the aid of the SCADA system it is possible to analyze and process the captured data during test experiments, making measurements with strain gauges.

Using this unit photoelastic experiments and practices of transparent test specimens (models) may be performed.

The different test specimens are subjected to loading by external forces and have polarised light shone through them.

A load application element can apply tensile, bending, compressive, and distributed and punctual loads to the specimen.

The stresses and strains occurring in the test specimen are represented as bright spots or figures of different colours, and we can visualise the distribution of stress.

We offer a wide range of test specimens for making a variety of practices and experiments.

These specimens show a full color and high contrast results and are also made of a special very hard material that avoids breaking during daily use.

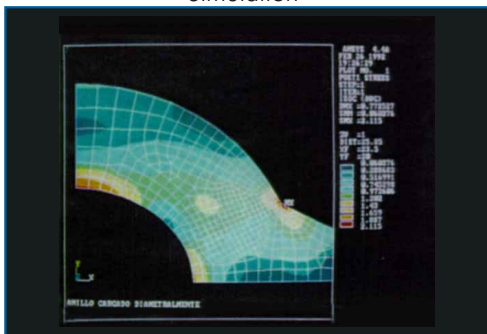
The unit includes specimens with strain gauges and the accessories (electronic, mechanical and software) for acquiring all the values in the computer in real time and allows to compare the advantages of one method with the other.

It is also very useful for Young's module determination of the material and fringe order and band order calculation.

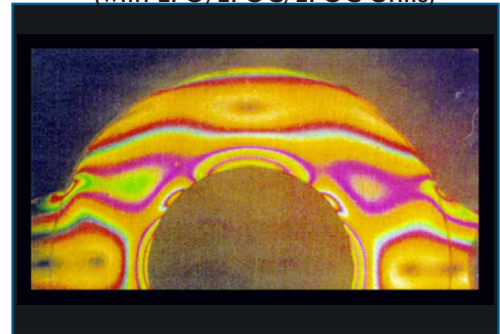
## RESULTS

### 1. Differences between the simulation and the photoelastic reality

Software  
Simulation

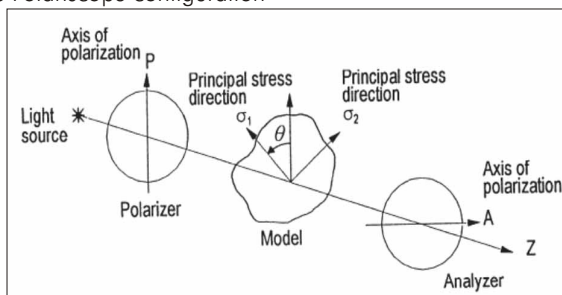


**Real**  
(with EFO/EFOC/EFOV Units)

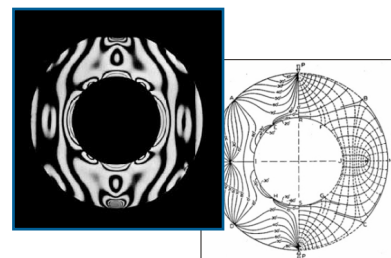


### 2. Main configurations with EFO/EFOC/EFOV Units

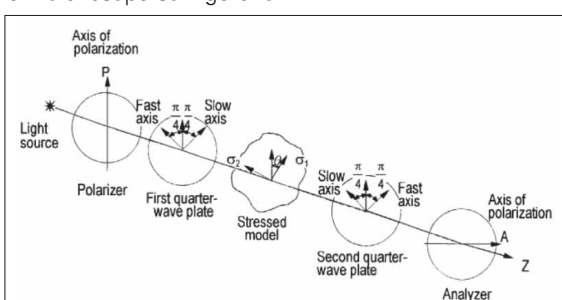
#### Plane Polariscope configuration



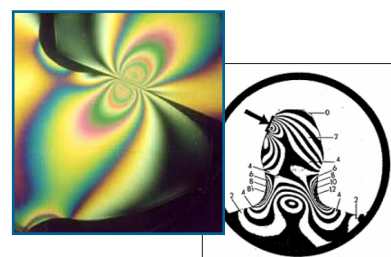
Plane polariscope configuration with monochromatic light, for isoclines and direction of principal stresses determination.



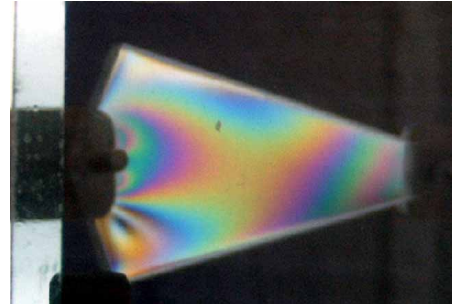
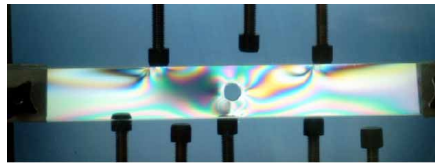
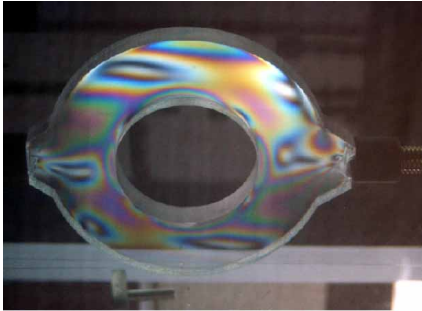
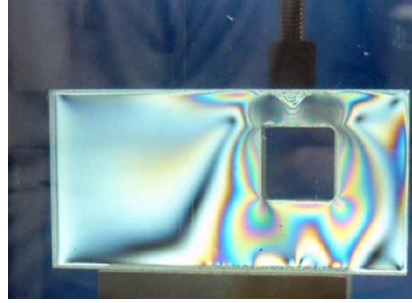
#### Circular Polariscope configuration



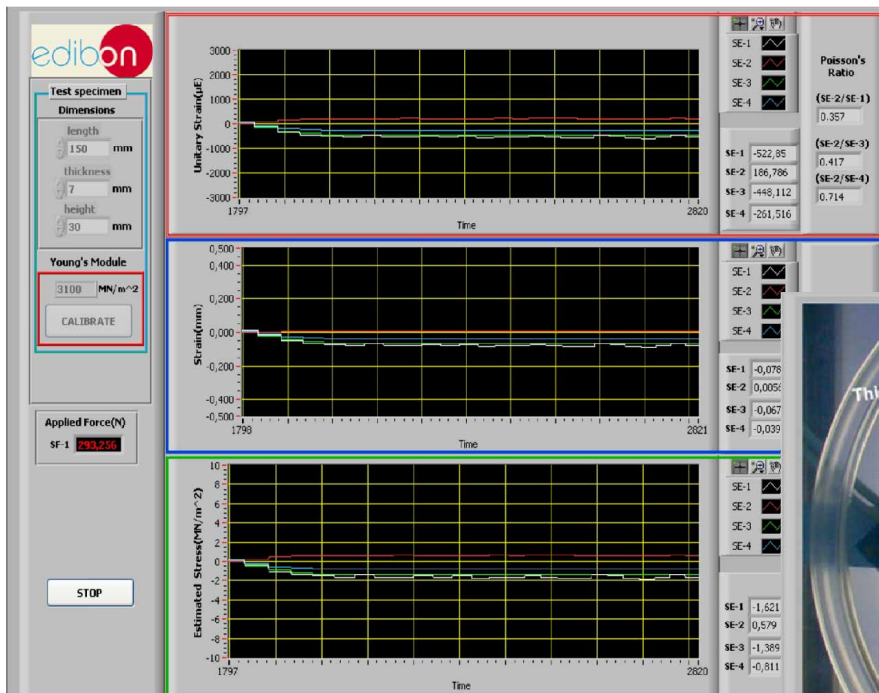
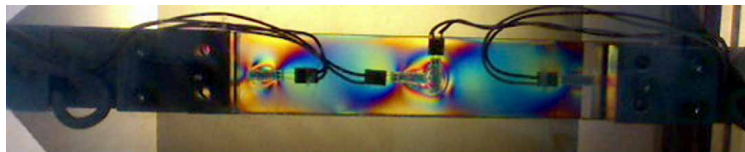
Circular polariscope configuration for isochromatics and principal stresses difference determination.



### 3. Some typical results with EFO/EFOC/EFOV Units and different specimens

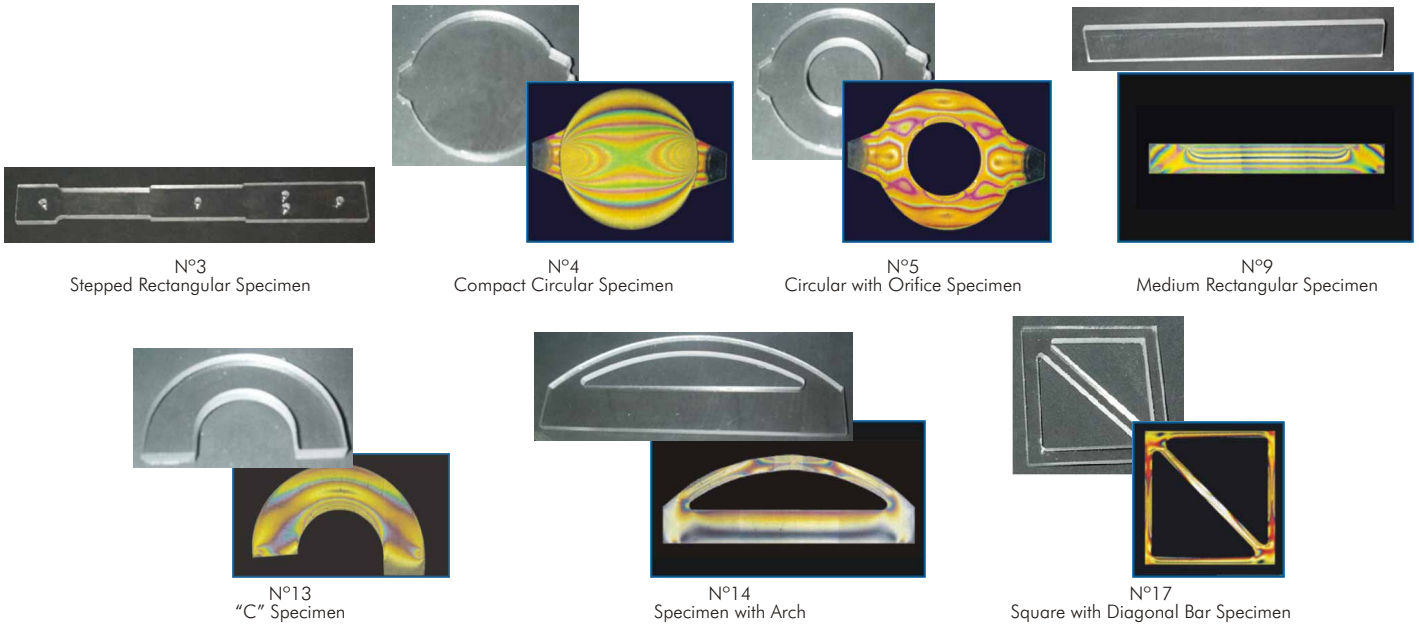


### 4. Some typical results for strain gauges analysis

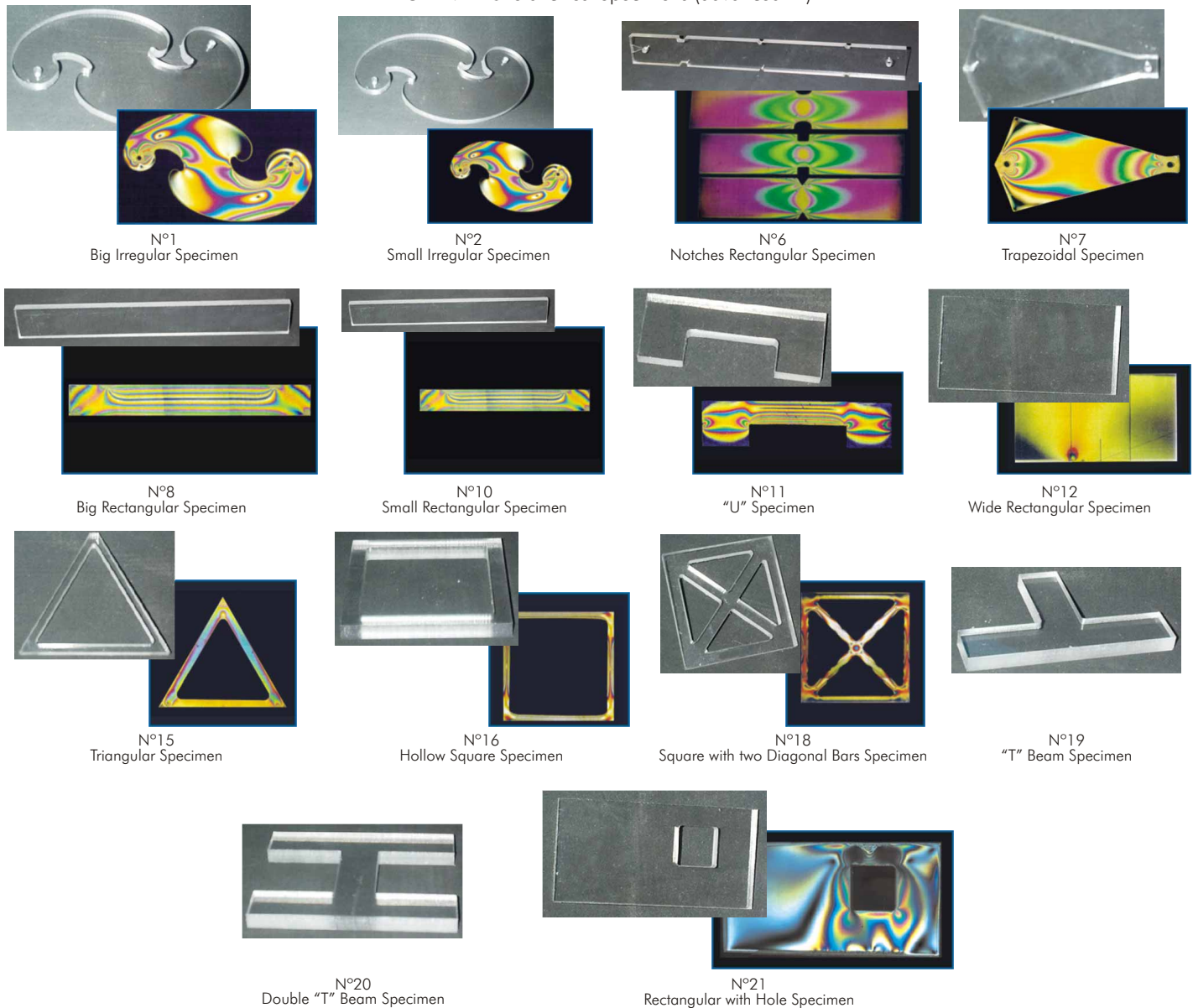




EFO-K1. Kit of Static Test Specimens (basic kit) (always included with the EFOC unit)

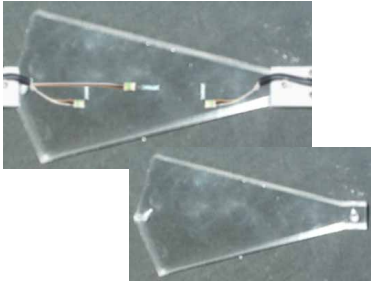


EFO-K2. Kit of Static Test Specimens (advanced kit)



## Test Specimens

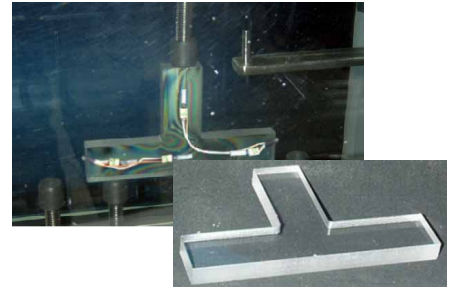
### EFO-K3. Kit of Test Specimens with Strain Gauges (basic kit) (always included with the EFOC Unit)



N°7-G.  
Trapezoidal Specimen with strain gauges  
+  
N°7  
Trapezoidal Specimen

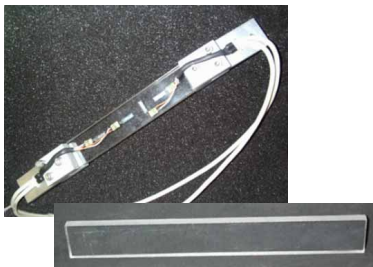


N°8-G.  
Big Rectangular Specimen with strain gauges  
+  
N°8  
Big Rectangular Specimen



N°19-G.  
"T" Beam Specimen with strain gauges  
+  
N°19  
"T" Beam Specimen

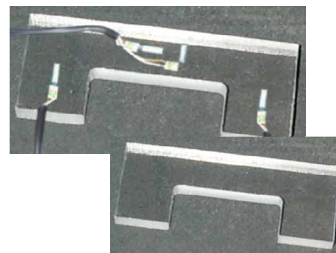
### EFO-K4. Kit of Test Specimens with Strain Gauges (advanced kit)



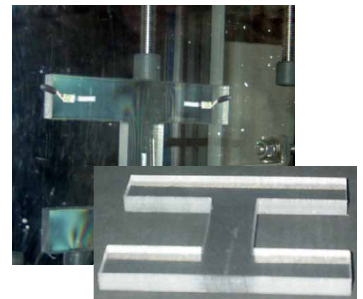
N°9-G.  
Medium Rectangular Specimen with strain gauges  
+  
N°9.  
Medium Rectangular Specimen



N°10-G.  
Small Rectangular Specimen with strain gauges  
+  
N°10.  
Small Rectangular Specimen

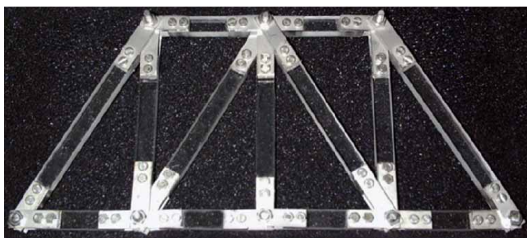


N°11-G.  
"U" Specimen with strain gauges  
+  
N°11.  
"U" Specimen

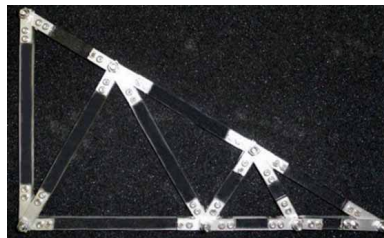


N°20-G.  
Double "T" Beam Specimen with strain gauges  
+  
N°20.  
Double "T" Beam Specimen

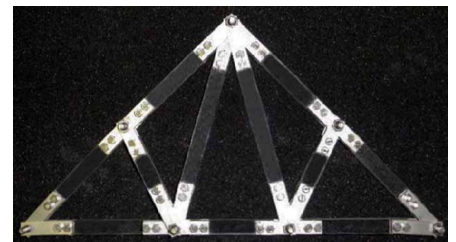
### EFO-K5. Kit of Articulated Structures



N°30  
Articulated Structure 1

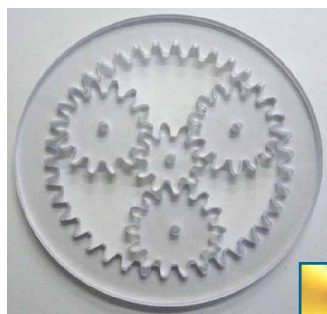


N°31  
Articulated Structure 2

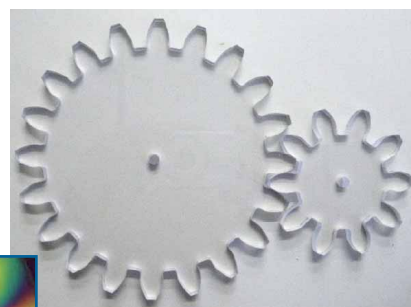


N°32  
Articulated Structure 3

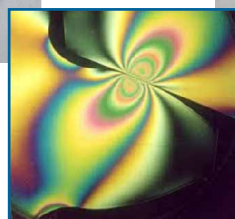
### EFO-K6. Kit of Dynamic Panels



N°40  
Dynamic Panel 1



N°41  
Dynamic Panel 2



## SPECIFICATIONS

Items always included in the minimum supply

### ① EFOC. Unit:

- EFO. Unit
- Bench-top unit.
- Anodized aluminium structure.
- Main metallic elements in stainless steel.
- Light source, two fluorescent tubes of 30 cm and 8W.
- Monochromatic light 35W.
- Opalescent diffuser plate.
- Double effect polarizing filters (linear polarization and circular polarization), of 30 x 30 cm and protected by methacrylate plates.
- Load frame with pulling jack.
- 10 pressure screws and accessories.

This unit is supplied with:

- EFO-K1. Kit of Static Test Specimens (basic kit), formed by:
  - Nº3. Stepped Rectangular Specimen.
  - Nº4. Compact Circular Specimen.
  - Nº5. Circular with Orifice Specimen.
  - Nº9. Medium Rectangular Specimen.
  - Nº13. "C" Specimen.
  - Nº14. Specimen with Arch.
  - Nº17. Square with Diagonal Bar Specimen.
- EFO-K3. Kit of Test Specimens with Strain Gauges (basic kit), formed by:
  - Nº7-G. Trapezoidal Specimen with strain gauges + Nº7. Trapezoidal Specimen.
  - Nº8-G. Big Rectangular Specimen with strain gauges + Nº8. Big Rectangular Specimen.
  - Nº19-G. "T" Beam Specimen with strain gauges + Nº19. "T" Beam Specimen.
- EFOC-KIT.
- Load cell for direct force measurement. Electronics, hardware and software for strain gauges measurement from PC, and direct force measurement applied to the specimens.

Additional and optional Test Specimens, see page 9. (Not included in the minimum supply).

### ② EFOC/V/CIB. Control Interface Box:

- Metallic box.
- Sensors connectors.
- Main switch.

### ③ UDAB. USB Data Acquisition Board:

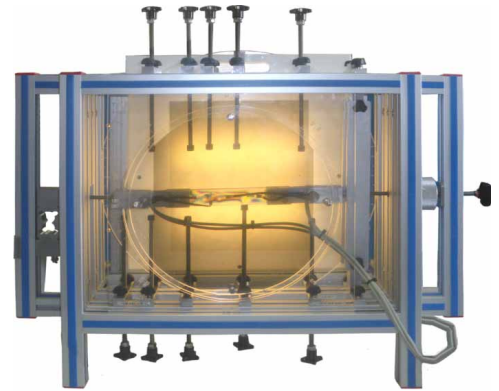
- USB Data acquisition board (National Instruments).
- Bus USB.
- Analog input:
  - Number of channels= 8.
  - Resolution= 12 bits.
  - Sampling rate: 10 KS/s (Kilo samples per second).
- Analog output:
  - Number of channels=2.
  - Resolution= 12 bits.
  - Output rate: 150Hz.
- Digital Input/Output:
  - Number of channels= 12 inputs/outputs.
- 1 Counter/timer. Resolution: 32 bits.

### ④ EFOC/CCSOF. Computer Control+Data Acquisition+Data Management Software:

- Compatible with actual Windows operating systems.
- Control and Data Acquisition in real time.
- Management, processing, comparison and storage of data.

### 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.



EFOC. Unit



EFO-K1. Kit of Static Test Specimens (basic kit)



EFO-K3. Kit of Test Specimens with Strain Gauges (basic kit)



EFOC/V/CIB



UDAB



EFOC/CCSOF

\* References 1 to 6: EFOC + EFOC/V/CIB + UDAB + EFOC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.



Some Practical Possibilities of the Unit:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1.- Introduction to photoelasticity: optical elements, isochromatic, isoclinic, band order, band factor, edge tension sign, etc.</li> <li>2.- Determination of principal stress difference.</li> <li>3.- Isochromatics.</li> <li>4.- Illustration of the themes about elasticity, strength of materials and structures using photoelastic tests.</li> <li>5.- Pure traction/optical-tensional law.</li> <li>6.- Diametrically compressed disc.</li> <li>7.- Ring with diametrical compression traction.</li> <li>8.- Ring with diametrical compression.</li> <li>9.- Plate with circular drill with traction.</li> <li>10.- Comparison of the effects from different engraves in piece with traction.</li> <li>11.- Pure traction in a piece with section linearly variable.</li> <li>12.- Pure flexion.</li> <li>13.- Simple flexion.</li> <li>14.- Simple flexion, compound beams.</li> </ul> | <ul style="list-style-type: none"> <li>15.- Compound flexion.</li> <li>16.- Compound central core of the section.</li> <li>17.- Piece with a great curvature subjected to flexion.</li> <li>18.- Arch built-in with a central charge.</li> <li>19.- Triangular structure.</li> <li>20.- Comparison of the structures.</li> <li>21.- Comparison of the effect of different notches.</li> <li>22.- Strain and stress analysis and measurements with strain gauges using computer.</li> </ul> |
|--|--|

**REQUIRED SERVICES**

- Electrical supply: single-phase, 220V./50Hz or 110V./60Hz.
- Computer (PC).

**DIMENSIONS & WEIGHTS**

EFOC:

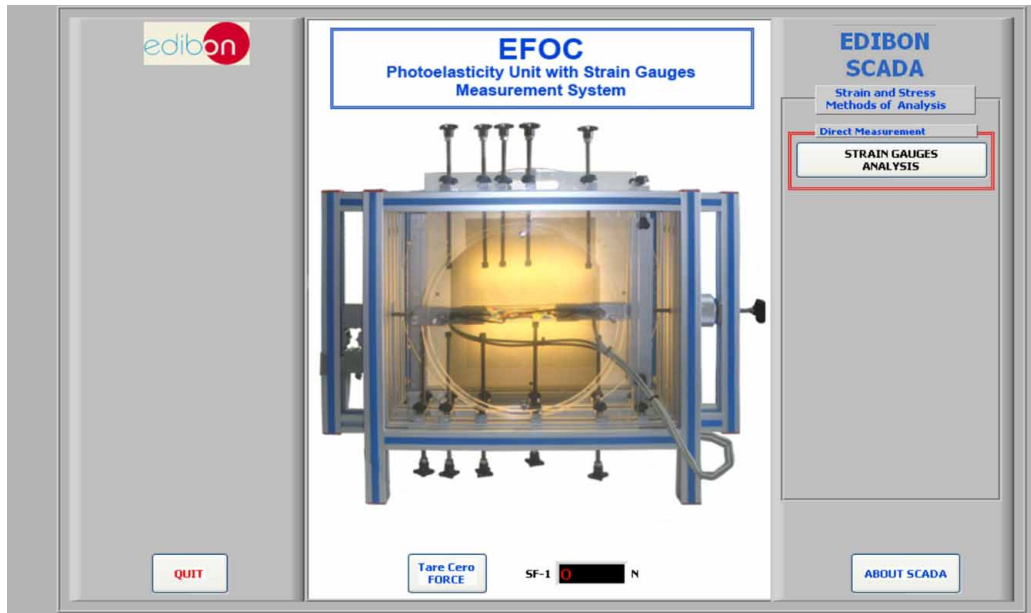
Unit:

- Dimensions: 750 x 400 x 550 mm. approx.  
(29.53 x 15.75 x 21.65 inches approx.).
- Weight :22 Kg. approx. (48.5 pounds approx.).

Control Interface Box:

- Dimensions: 310 x 220 x 180 mm. approx.  
(12.20 x 8.66 x 7.09 inches approx.).
- Weight :3 Kg. approx. (6.6 pounds approx.).

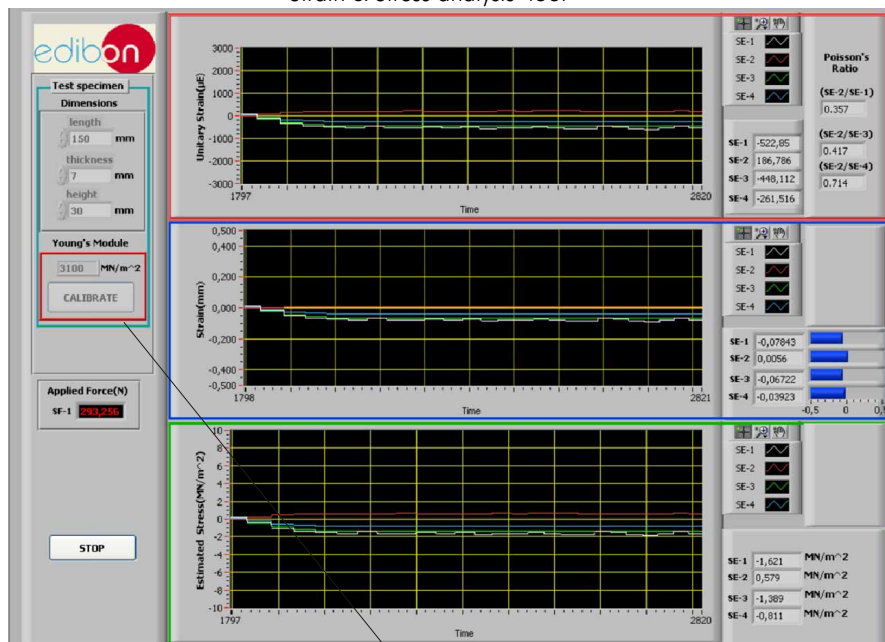
## Main screen



This is the main screen, where the different tasks that can be carried out with this unit are shown.

On the right-hand side of the screen, we find the button that controls the action to carry out on the deformation analysis measured with strain gauges.

## "Strain &amp; Stress analysis" tool



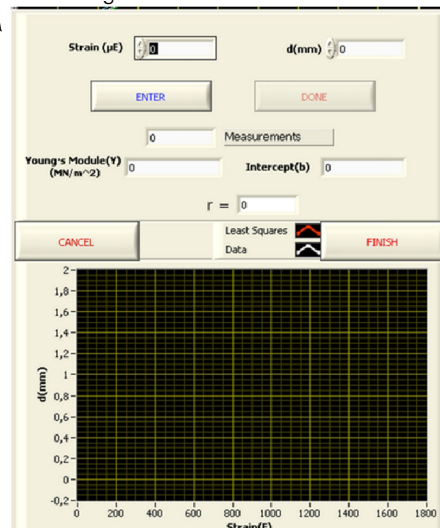
This screen can graphically represent in real time values taken by the sensors and visualise the evolution of those measures in the time.

The digital indicators of the right-hand side are labeled with the names of the sensors.

On the left-hand side of the screen, we find the necessary controls to introduce the geometrical data of the specimen with gauges to analyse.

Clicking on the START button, the data acquisition, in real time, begins for strain measurement and stress suffered on the four points of the specimen.

## Young's Module Calibration Screen



This screen has the necessary tools to obtain the value of Young's module of the specimen, applying least squares method.



## ADDITIONAL AND OPTIONAL TEST SPECIMENS

-EFO-K2. Kit of Static Test Specimens (advanced kit), formed by:

- Nº1. Big Irregular Specimen.
- Nº2. Small Irregular Specimen.
- Nº6. Notches Rectangular Specimen.
- Nº7. Trapezoidal Specimen.
- Nº8. Big Rectangular Specimen.
- Nº10. Small Rectangular Specimen.
- Nº11. "U" Specimen.
- Nº12. Wide Rectangular Specimen.
- Nº15. Triangular Specimen.
- Nº16. Hollow Square Specimen.
- Nº18. Square with two Diagonal Bars Specimen.
- Nº19. "T" Beam Specimen.
- Nº20. Double "T" Beam Specimen.
- Nº21. Rectangular with Hole Specimen.

-EFO-K4. Kit of Test Specimens with Strain Gauges (advanced kit), formed by:

- Nº9-G. Medium Rectangular Specimen with strain gauges + Nº9. Medium Rectangular Specimen.
- Nº10-G. Small Rectangular Specimen with strain gauges + Nº10. Small Rectangular Specimen.
- Nº11-G. "U" Specimen with strain gauges + Nº11. "U" Specimen.
- Nº20-G. Double "T" Beam Specimen with strain gauges + Nº20. Double "T" Beam Specimen.

-EFO-K5. Kit of Articulated Structures, formed by:

- Nº30. Articulated Structure 1.
- Nº31. Articulated Structure 2.
- Nº32. Articulated Structure 3.

-EFO-K6. Kit of Dynamic Panels, formed by:

- Nº40. Dynamic Panel 1.
- Nº41. Dynamic Panel 2.

## AVAILABLE VERSIONS

Offered in this catalogue:

-EFOC. Photoelasticity Unit with Strain Gauges Measurement System.

Offered in other catalogues:

-EFOV. Photoelasticity Unit with Strain Gauges Measurement System and Artificial Vision System.

-EFO. Photoelasticity Unit.

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



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REPRESENTATIVE:

