

**FL 210**

**Photoelastic Demonstration**



The picture shows the FL 210 unit with a standard commercially available overhead projector (not supplied).

- \* **Representation of distribution of stress in component models with the aid of photoelasticity**
- \* **Demonstration unit as mounting for overhead projector**
- \* **Generation of stress patterns with plane or circular polarised light**
- \* **Identification of stress concentrations**
- \* **Green filter for monochromatic illumination**
- \* **8 polycarbonate models as typical components**
- \* **Additional models available as accessories**

**Technical Description**

Photoelasticity can be used to demonstrate distribution of stress and stress concentrations in component models. Using polarised light, the distribution of stress in flat, transparent bodies (plastic models) is investigated. Polarisation filters represent the distribution of stress in colours. The notching and point loading and the criteria dictating component design are clearly visualised.

FL 210 is portable to use with overhead projectors. Various models made of transparent plastic are mounted in a frame. A load application device is used to apply compressive or tensile loads to the model under investigation by means of a spindle.

An arrangement of polarisation filters and quarter wave filters generates optionally plane or circular polarised light. A green filter is supplied as part of the package to generate monochromatic light. The light source is an overhead projector (e.g. FL 210.01). The use of monochromatic light produces a system of dark and light stripes providing indications of the distribution and magnitude of mechanical stresses. The supplied models represent typical examples, permitting experimentation in relation to notching and point loading. The distribution of stress shown in the model is identical to that in the actual part under design.

Additional models are also available to represent distribution of stresses in bolted connections, roller bearings, wrenches and tooth profiles.

All the component elements of the experiment are clearly laid-out and housed securely in a box.

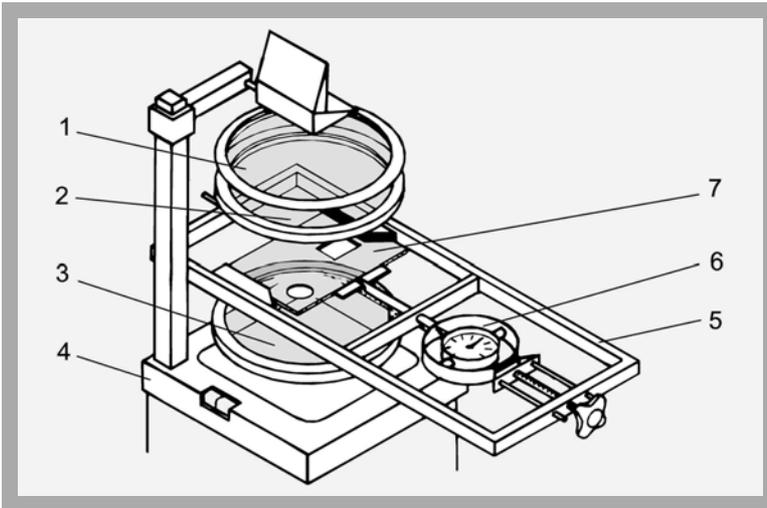
The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

**Learning Objectives / Experiments**

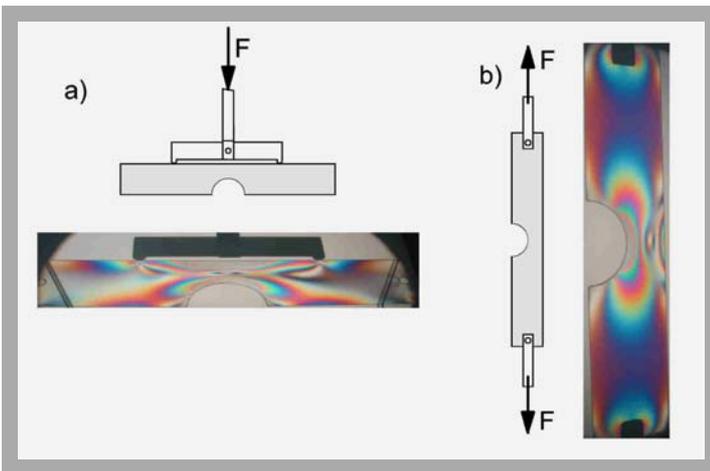
- Generation of planar stress states in various models under load
  - \* compressive load
  - \* tensile load
- Investigation of distribution of stresses with plane or circular polarised light
- Interpretation of photoelastic fringe patterns
  - \* distribution of stress
  - \* stress concentration

**FL 210**

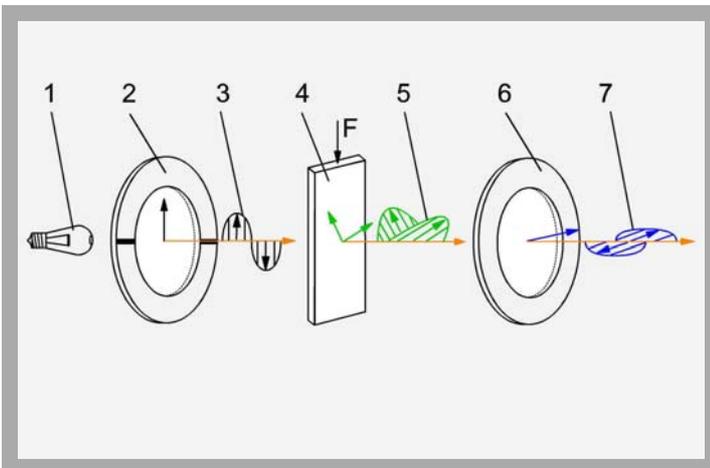
**Photoelastic Demonstration**



1 green filter, 2 analyser, 3 polariser, 4 overhead projector (FL 210.01), 5 frame, 6 load application device with force gauge, 7 plastic model



a) model under bending load, distribution of stress,  
b) model under tensile load, distribution of stress



Schematic representation of the photoelastic demonstration:  
1 light source, 2 polariser, 3 plane polarised light, 4 model under load, 5 light refracted into the directions of principal stresses, 6 analyser, 7 optical interference leading to the formation of the isochromatic fringe pattern

**Specification**

- [1] Photoelastic experiments with an overhead polariscope
- [2] Polariser and analyser each comprising a polarisation filter and quarter wave filter
- [3] Filter enclosed, with stress-free glazing
- [4] All filters rotatable in any direction on the horizontal plane
- [5] Plane or circular polarised light possible
- [6] Green filter for monochromatic light
- [7] Load application device with force gauge for compressive and tensile loading
- [8] 8 different polycarbonate (PC) models supplied
- [9] Box to house the components

**Technical Data**

- Filter holder
- 2 filter, enclosed in glass, each comprising
    - 1 polarisation filter, diameter:  $d=165\text{mm}$
    - 1 quarter wave filter, diameter:  $d=165\text{mm}$
    - 1 green filter, diameter:  $d=150\text{mm}$
- Load application device with force gauge
- Load force:  $0 \dots 250\text{N}$
- 8 models, PC
- bar without notches
  - bar with hole
  - bar notched on one side
  - bar notched on both sides
  - rectangle without cut-outs
  - rectangle with cut-outs
  - fork
  - crane hook

**Dimensions and Weight**

- l x w x h:  $500 \times 190 \times 30 \text{ mm}$  (frame)
- l x w x h:  $280 \times 280 \times 90 \text{ mm}$  (filter holder)
- Weight: approx. 8 kg

**Scope of Delivery**

- 1 frame with load application device
- 1 filter holder with polariser and analyser
- 1 green filter
- 8 photoelastic models
- 1 box with foam inlay
- 1 set of instructional material

**Order Details**

021.21000 FL 210 Photoelastic Demonstration

**FL 210**

***Photoelastic Demonstration***

Available accessories and options:

<b>Item no.</b>	<b>Description</b>
021.21001	FL 210.01 Overhead Projector
021.21010	FL 210.10 Model - Bolted Connection
021.21011	FL 210.11 Model - Rolling Bearing
021.21012	FL 210.12 Model - Wrench
021.21013	FL 210.13 Model - Pinion