



## Description

Experiment modules supplied with the Structures platform, this product helps students understand the deflections and reactions of a portal frame under various loading conditions. Students fit one of a choice of two frames between two supports and apply vertical loads to the beam member. Load cells in the supports measure the bending moment and horizontal reaction at the base of the uprights due to the load. A precision indicator measures any horizontal deflection (sway) at the junction of the beam and the upright. Each support includes pointers that work with the scale on the platform for accurate positioning. One of the frames has a uniform second moment of area for both the uprights and the beam, the other has one upright with a second moment of area of approximately half that of the other upright and the beam. Both frame beams can be loaded anywhere along their length. This allows the students to understand the two causes of frame sway other than direct loads. Students apply loads to the portal frame. They use textbook equations and analysis to predict the reaction forces and fixing moments due to the load and whether or not the frame will sway and its magnitude. They compare predictions to measured and observed results. This helps confirm the reliability of the textbook equations and the accuracy of the experiment results. The deflection indicator has its own display but it can connect (with the load cells) to the USB interface hub of the Structures platform for computer display and data acquisition.

## Learning objectives/experiments

- Horizontal reaction and fixing moment due to a varying single point load on a portal frame
- Uniform and non-uniform cross-section portal frames
- Predicting sway direction by consideration of shear forces
- Use of the moment distribution (Hardy Cross) method to calculate bending moments, sway magnitude and horizontal support reactions
- Deflection (sway) of a portal frame due to loading asymmetry
- Deflection (sway) of a portal frame due to asymmetry of the uprights
- Plotting bending moment diagrams

*Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.*



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**Key features**

- Experiment modules that teach structures principles
- Fits to the Structures platform for ergonomic use and space-saving storage
- Includes two different portal frames for experiments with uniform and non-uniform cross-section frames
- Includes Vernier calliper for measurement of cross-section
- Supplied with a storage tray to keep smaller items safe
- Direct reading of horizontal reaction and fixing moment for quick and simple experiments
- Works with user-friendly software

**Structure Platform**

The structure platform is made from precision, 6 slotted 100mm x 50mm anodised aluminium extrusions(2 No. arranged parallelly to each other) and steel end-plates, this forms a sturdy, rigid, stable and strong experiment platform. Designed for easy assembly and to fit on any standard desktop.

Adjustable feet ensure the platform is level before use. Easy-to-read scales on each side of the platform help students to position the parts of their experiment precisely, and removes the need for an additional rule.

The compact size and low centre of gravity means that the students can use the equipment easily and at an ergonomic height, either sitting or standing(determined by bench height).

The platform includes the use interface plug and play 'Hub' to simplify connections. The hub converts signals from the sensors on experiment module to USB data format for computer display and data acquisition.

**Software**

Data acquisition applications(LabView based) for experiment module.

**Item included**

- Hexagon tool
- USB interface hub and fixings
- USB cable
- AC mains adapter
- User guide
- Software
- Two supports, one with horizontal reaction load cell, the other with a fixing moment load cell
- Uniform frame of 250 mm height x 500 mm length and nominal cross-section: 15 mm x 2 mm
- Non-uniform frame of 250 mm height x 500 mm length. Nominal cross-sections 15 mm x 2 mm and one vertical of 15 x 1.5 mm
- Three cables

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- Three mass hangers (made of PVC)
- 25 x 20 g masses (made of brass)
- Storage tray
- Comprehensive user guide



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