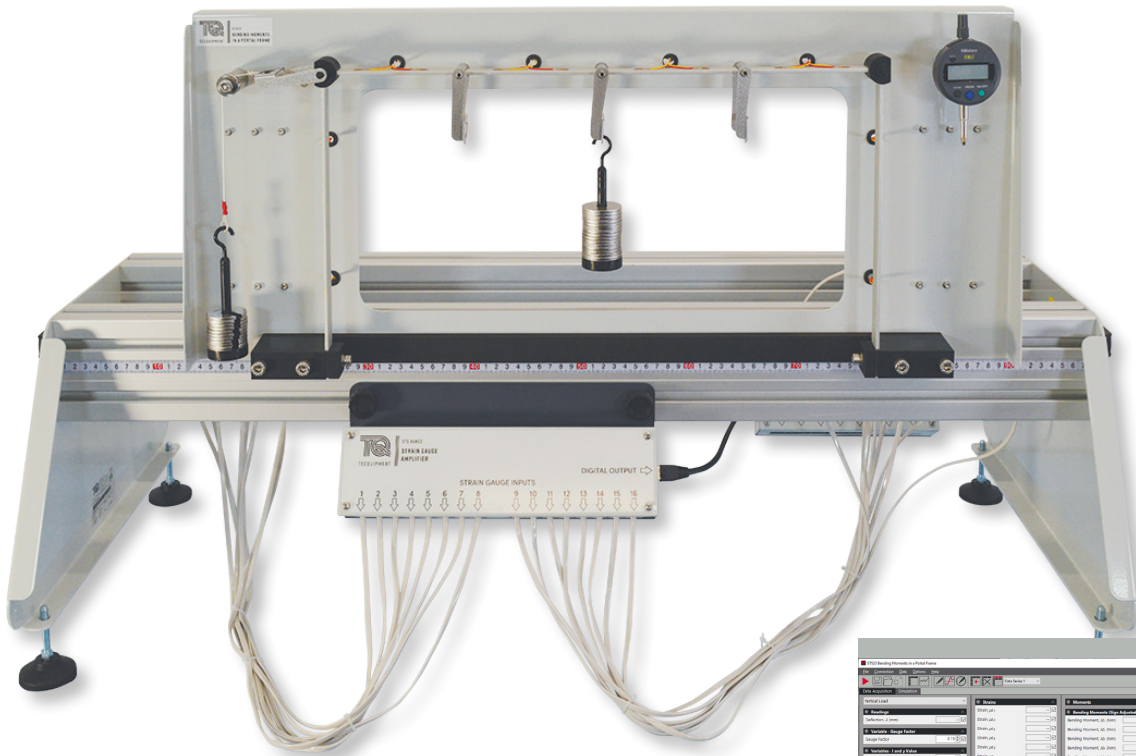


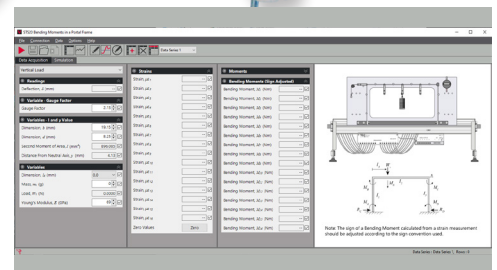
BENDING MOMENTS IN A PORTAL FRAME

VDAS[®] ONBOARD STS20

Experiment for the study of bending moments and sway in portal frames. Mounts on the Structures platform and connects to the Structures automatic data acquisition unit and software (VDAS[®] Onboard).



SHOWN FITTED TO THE STRUCTURES PLATFORM (STS1, AVAILABLE SEPARATELY)
LAPTOP NOT INCLUDED



SCREENSHOT OF THE VDAS[®] SOFTWARE

KEY FEATURES

- One of a range of experiment modules that teach structures principles
- Fits to the Structures platform for ergonomic use and space-saving storage
- Industrial, high-resolution digital deflection indicator for accurate results
- Multiple strain gauges for a complete set of measurements around the portal frame
- Includes moment arms and vertical and horizontal loads to replicate floor supports and point loads
- Includes Vernier caliper for cross-section measurement
- Supplied with a storage tray to keep smaller items safe
- Works with user-friendly software (VDAS[®])
- Complementary experiment available: Frame Deflections and Reactions (STS18)

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DESCRIPTION

One of a range of experiment modules that fit to the Structures platform (STS1, available separately), this product helps students to understand the bending moments around a portal frame due to a loads. Students add vertical or horizontal or combinational loads to a portal frame held between two fixing blocks. They may also add loads to moment arms on the vertical members (columns) of the frame. These simulate the effect of internal and external cantilever floors of a structure. Strain gauges at key points around the portal measure the strains and in turn the bending moment due to the loads. A precision indicator measures any horizontal deflection (sway) due to the load. The positions of the strain gauges and resulting measured bending moments allow students to plot bending moment diagrams for the frame for different loading conditions, allowing comparison to calculated results.

Students use textbook analysis methods to predict the bending moments at key positions, along with the sway magnitude (if any).

This product includes a Vernier caliper for accurate measurement of cross-section.

The strain gauges connect to a strain gauge amplifier which connects (with the deflection indicator) to the USB interface hub of the Structures platform for computer display and data acquisition (VDAS® Onboard).

STANDARD FEATURES

- Supplied with comprehensive user guide
- Five-year warranty
- Made in accordance with the latest European Union directives
- ISO9001 certified manufacturer

LEARNING OUTCOMES

- Strain gauges as instruments
- Relationship between measured strain and bending moment
- Elastic bending of portal frames, and linear relationship between the bending moments in the frame and the load
- Use of the moment distribution (Hardy Cross) method to calculate bending moments, sway magnitude and horizontal support reactions.
- The generation and measurement of sway deflections and bending moments around the frame due to:
 - Vertical loads on the beam
 - Horizontal loads at the junction of the beam and uprights
 - Moments applied to the uprights
 - Any combination of the above
- Plotting of bending moment diagrams

ESSENTIAL ANCILLARY

- Structures Platform (STS1)

SOFTWARE

TecEquipment has created data acquisition applications (VDAS® Onboard) for each experiment module, with additional simulated experiments.

The simulated experiments allow students to simulate the hands-on laboratory experiments, verifying their results. They also allow simulation of alternative set-ups, such as other loading conditions and portal properties, extending the learning experience beyond the practical laboratory session.

OPERATING CONDITIONS

OPERATING ENVIRONMENT:

Laboratory

STORAGE TEMPERATURE RANGE:

-25°C to +55°C (when packed for transport)

OPERATING TEMPERATURE RANGE:

+5°C to +40°C

OPERATING RELATIVE HUMIDITY RANGE:

80% at temperatures < 31°C decreasing linearly to 50% at 40°C



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SPECIFICATIONS

TecQuipment is committed to a programme of continuous improvement; hence we reserve the right to alter the design and product specification without prior notice.

DIMENSIONS AND WEIGHT:

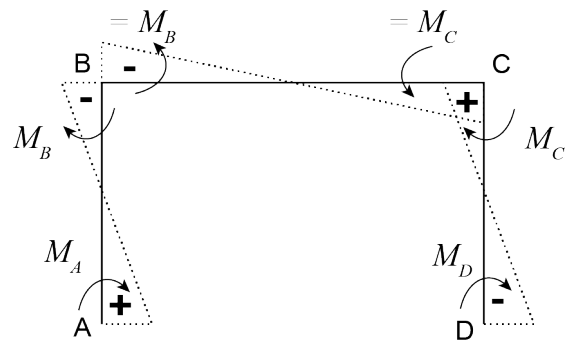
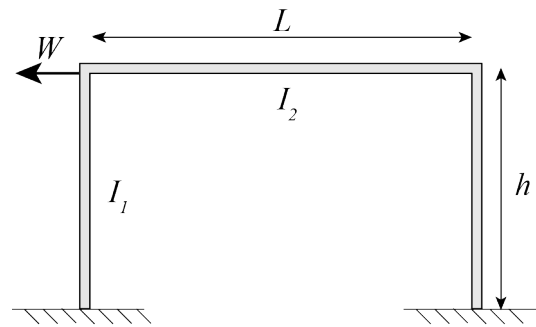
- Nett (assembled): 760 mm long x 90 mm front to back and 380 mm high and 9 kg
- Approximate primary packed (with storage tray): 0.1 m³ and 12 kg

SPACE NEEDED:

- 1500 mm x 600 mm, level bench or desk

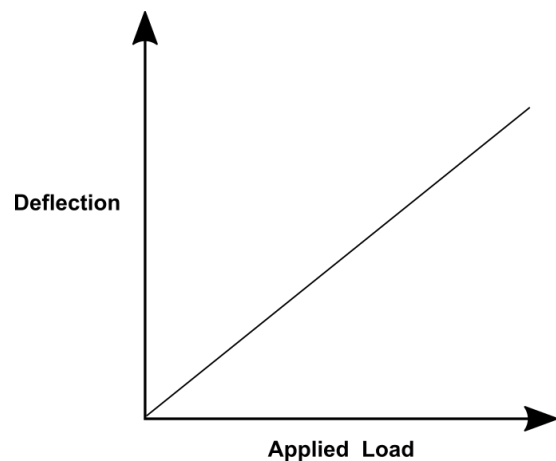
ITEMS INCLUDED:

- Backplate holding the portal frame of 250 mm x 495 mm (section centre distances); nominal cross section: 19 mm x 3.2 mm
- 16 strain gauges attached to portal
- Strain gauge amplifier, 16 input
- Deflection indicator of resolution 0.01 mm
- Two cables
- Hexagon tool for fixings
- Vernier caliper
- Four mass hangers
- 50 x 20 g masses
- Storage tray
- Comprehensive user guide



Bending Moment Diagram

TYPICAL EXPERIMENT RESULTS SHOWING THE BENDING MOMENT DIAGRAM FOR A HORIZONTAL LOAD



TYPICAL EXPERIMENT RESULTS COMPARING DEFLECTION WITH APPLIED LOAD