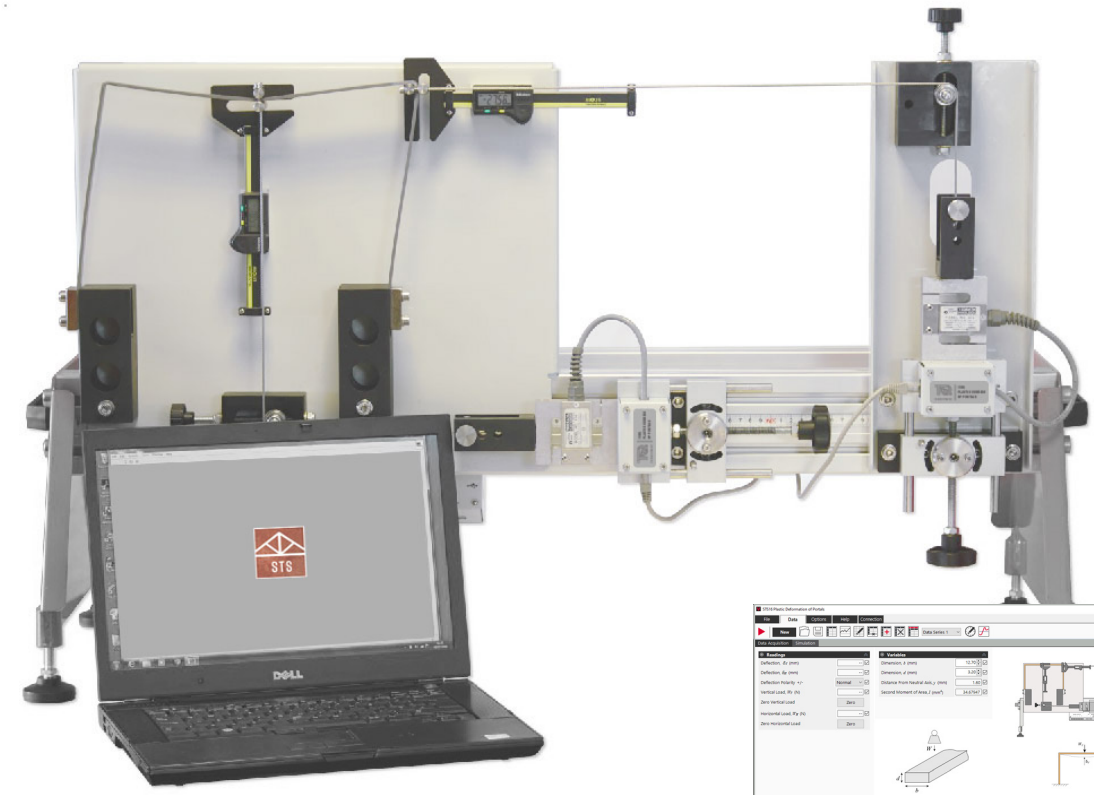
PLASTIC BENDING OF PORTAL FRAMES

VDAS® ONBOARD STS16

Experiment for the study of plastic theory and limit state design 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 (STSI, 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
- Vertical and horizontal load and measurement for increased experiment range
- Includes a set of specimen portals for 'out of the box' experiments
- Additional pack of specimen portals available
- Industrial, high-resolution digital deformation indicators for accurate results
- Includes Vernier caliper for cross-section measurement
- Supplied with a storage tray to keep smaller items safe
- Works with user-friendly software (VDAS®)

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PLASTIC BENDING OF PORTAL FRAMES

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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 nature of plastic deformation in hot-rolled mild steel portal frames that can undergo large plastic deformations. Similar frames at real-scale form parts of buildings with large internal spaces such as factories or warehouses.

Students fit the specimen portal frame to fixing blocks that simulate fixed foundations, and apply loads. Load cells measure the applied forces and precision indicators measure the portal deformation. Each load cell applies and measures the load through cables at 90 degrees to the portal. This preserves the load direction as the portal deforms.

Students apply either vertical, horizontal or combined loads to the portal, forcing it to bend through the elastic region and into the plastic region where it deforms permanently, experiencing 'plastic collapse' and the formation of 'plastic hinges'. This allows students to appreciate the ratio between yield moment and the fully plastic moment (shape or form factor), showing how this ratio provides an additional safety factor. It explains how a building may fail, but still withstand loads to allow people to safely leave before complete collapse. It also shows the interaction between the vertical and horizontal loads and the production of an interaction diagram to predict the failure mode. Students use textbook equations to predict the results, comparing them to measured results. This helps confirm the reliability of the textbook equations and the accuracy of the experiment results.

NOTE: The experiments are destructive tests, so you use each portal only once. This product includes a set of additional specimen portals to allow experiments 'out of the box', and a Vernier caliper for accurate measurement of cross-section.

The deformation indicators have their own displays, but they can connect (with the load cells) 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

- Elastic bending to plastic deformation of portal frames
- Collapse load and the formation of plastic 'hinges'
- Yield stress
- Deformation due to single and combined loads on a portal frame
- Generating an interaction diagram
- Shape of a collapsed portal due to hinge formation
- Introduction to limit state design
- Shape or form factor and the additional factor of safety it provides

ESSENTIAL ANCILLARY

- Structures Platform (STS1)

OPTIONAL ANCILLARY

- Pack of 12 specimen portals (STS16a)

SOFTWARE

TecQuipment 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 portals of different cross-sectional shape and shape factor, extending the learning experience beyond the practical laboratory session.

DEFLEX®

DefleX® is a complementary tool designed to introduce students to the concept and technique of Digital Image Correlation (DIC). This product is compatible with our DefleX®-2D product that uses one video camera and our DefleX®-3D product that uses two video cameras to track the movement of materials during a dynamic event. They are complete and compact systems for measuring full-field displacements and strains over a material's surface in two and three dimensions, offering students a digital blended learning experience as part of their engineering courses.

To find out more, click here

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VDAS ONBOARD STS16

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

SPECIFICATIONS

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

DIMENSIONS AND WEIGHT:

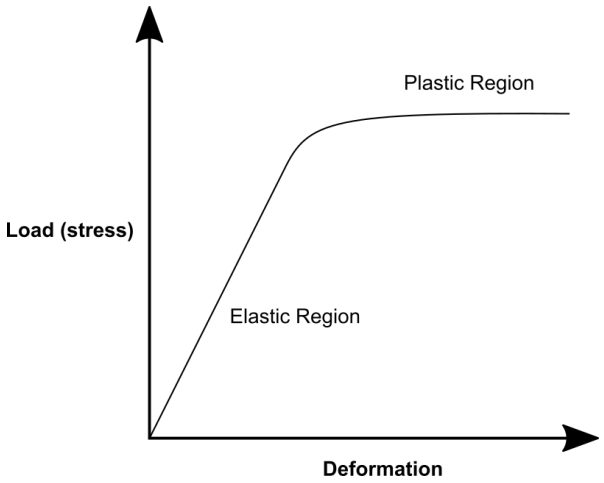
- Nett (assembled): 950 mm long x 130 mm front to back and 520 mm high and 24 kg
- Approximate primary packed (with storage tray): 0.12 m^3 and 27 kg

SPACE NEEDED:

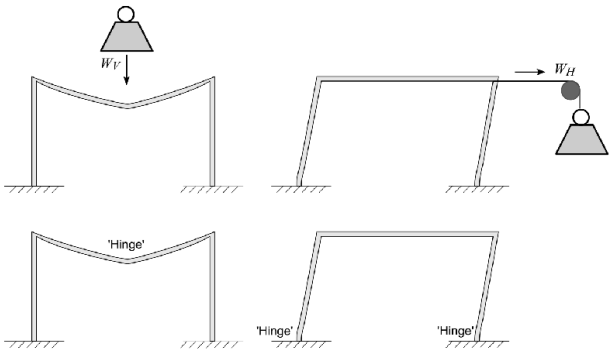
- 1500 mm x 600 mm, level bench or desk

ITEMS INCLUDED:

- Main frame with portal fixing blocks and deformation indicators of resolution 0.01 mm
- Vertical and horizontal load cells, maximum capacity 650 N
- Nine specimen portals of experiment size 200 mm height and 300 length and nominal cross section 3.2 x 12.7 mm
- Four cables
- Hexagon tools for fixings
- Vernier caliper
- Inclinometer
- Storage tray
- Comprehensive user guide



TYPICAL EXPERIMENT RESULTS SHOWING THE TRANSITION FROM ELASTIC TO PLASTIC BENDING



TYPICAL EXPERIMENT RESULTS COMPARING HINGE FORMATION FOR EACH LOAD CONDITION

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