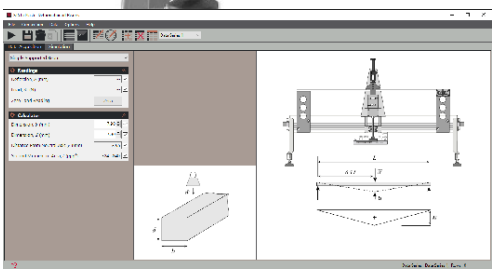
PLASTIC BENDING OF BEAMS

VDAS® ONBOARD STS15

Experiment for the study of plastic theory and limit state design of beams. Mounts on the Structures platform and connects to the Structures automatic data acquisition unit and software (VDAS® Onboard).



SCREENSHOT OF THE VDAS® SOFTWARE

SHOWN FITTED TO THE STRUCTURES PLATFORM (STS1, AVAILABLE SEPARATELY)

LAPTOP NOT INCLUDED

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
- Selectable beam fixing conditions, for increased experiment range
- Includes a set of specimen beams for 'out of the box' experiments
- Additional pack of specimen beams available
- Industrial, high-resolution digital deformation indicator for maximum measurement accuracy
- Includes Vernier caliper for beam 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 BEAMS

VDAS® ONBOARD STS15

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 and collapse in hot-rolled mild steel beams that can undergo large plastic deformations. This material is often used as a construction material in supporting beams or 'rebar' to reinforce concrete sections.

Students fit the specimen beam between two supports with a choice of fixing methods; simply supported, fixed or propped cantilever. One support includes roller bearings to allow horizontal translation. A load cell assembly measures and applies force at the mid span of the beam. A precision indicator measures the beam deformation.

Students apply a load (moment) to the beam, 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 them to appreciate the ratio between yield moment and the fully plastic moment (form or shape factor), showing how this ratio provides an additional safety factor. It explains how a structural element may fail, but still withstand loads to allow people to safely leave the structure or building. The different fixings allow students to predict the position of hinge formation and the loads that will cause failure.

Students use textbook beam equations and bending moment diagrams 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 beam only once. This product includes a set of additional specimen beams to allow experiments 'out of the box', and a Vernier caliper for accurate measurement of the beam cross-section.

The deformation indicator has its own display, but it can connect (with the load cell) 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 hot-rolled mild steel
- How the plastic region moves through the specimen section as the load increases
- Collapse load and the formation of plastic 'hinges'
- Yield stress
- How beam fixings affect deformation of:
  - simply supported beams
  - fixed or 'encastre' beams
  - a propped cantilever
- Shape of a collapsed beam due to hinge formation.
- Form or shape factor of a beam and the additional factor of safety it provides.

ESSENTIAL ANCILLARY

- Structures Platform (STS1)

OPTIONAL ANCILLARY

- Pack of 12 specimen beams (STS15a)

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

DEFLEX®

DefleX® is a complimentary 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

PLASTIC BENDING OF BEAMS

VDAS ONBOARD® STS15

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:

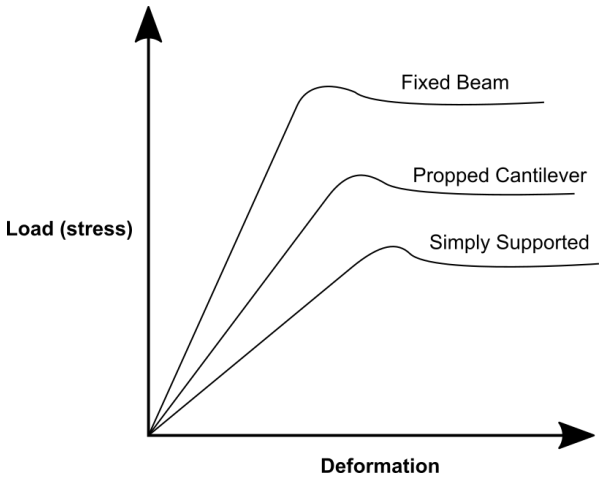
- Nett (assembled): 920 mm long x 130 mm front to back and 570 mm high and 18 kg
- Approximate primary packed (with storage tray): 0.07 m^3 and 20 kg

SPACE NEEDED:

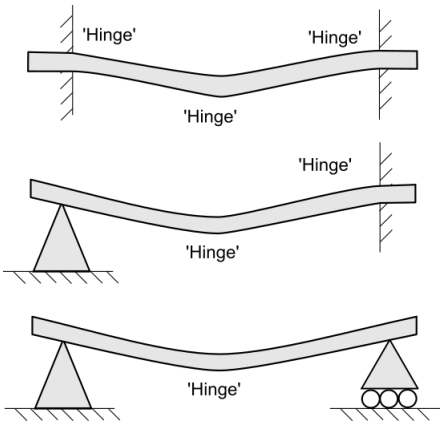
- 1500 mm x 600 mm, level bench or desk

ITEMS INCLUDED:

- Two beam supports with two fixing methods
- Support with digital deformation indicator of resolution 0.01 mm
- Load cell of maximum capacity 650 N
- Nine specimen beams of length 920 mm and nominal cross section 7.9 x 7.9 mm
- Two cables
- Hexagon tools for beam fixings
- Vernier caliper
- Inclinometer
- Storage tray
- Comprehensive user guide



TYPICAL EXPERIMENT RESULTS COMPARING THE DEFORMATION OF BEAMS WITH DIFFERENT FIXINGS



TYPICAL EXPERIMENT RESULTS COMPARING HINGE FORMATION FOR EACH FIXING METHOD

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