SE 130
Forces in a Howe truss

Description

- **measurement of bar forces on a single plane truss, Howe type**
- **measurement of bar forces by strain gauge measurement**
- **external load may be applied at different angles**

As light-weight structures offering a high degree of rigidity, trusses are employed in the construction of halls, bridges, cranes, pylons and masts. Trusses are bar structures in which the bars are subjected to compression or tension loading, but not to bending.

The SE 130 setup provides experiments on single plane trusses with a high degree of measuring accuracy and computerised result readout based on software. The ready assembled truss is mounted horizontally on a frame. The influence of the dead weight is minimized by horizontal experimental setup. The bars are joined by a "hinged" connection, using node disks. Consequently, our truss can be considered as an ideal truss. The external force is generated with the aid of a threaded spindle. The force can be applied in various directions and at various points.

The forces occurring on the truss bars are recorded by strain gauge measurement. All measuring points are housed together in a connection box. From there, they are connected to the measuring amplifier FL 152. The software is used to manage the measuring data and provide graphical representation of the bar forces. The software features a comprehensive help function.
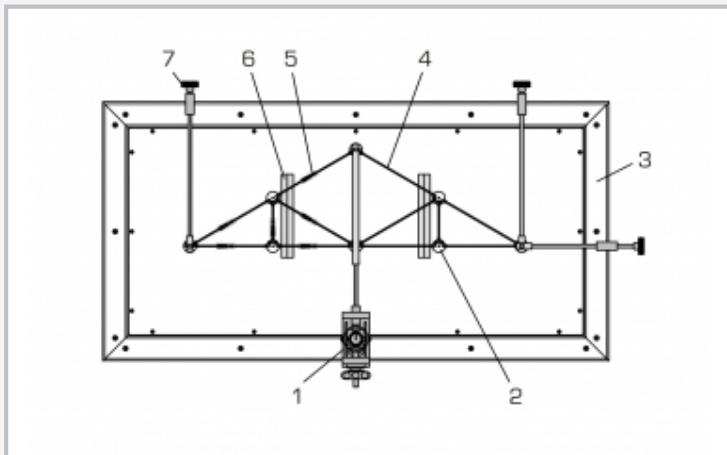
An additional truss is available to extend the scope of the experiment: SE 130.01, Warren type.

### Learning objectives/experiments

- measurement of the bar forces in a single plane truss, Howe type
- dependency of bar forces on the external force
  - ▶ magnitude, direction, point of application
- comparison of measuring results with mathematical and graphical methods
  - ▶ method of joints
  - ▶ Ritter's method of sections
  - ▶ Cremona diagram
- basic principle: measurement of forces using strain gauge measurement

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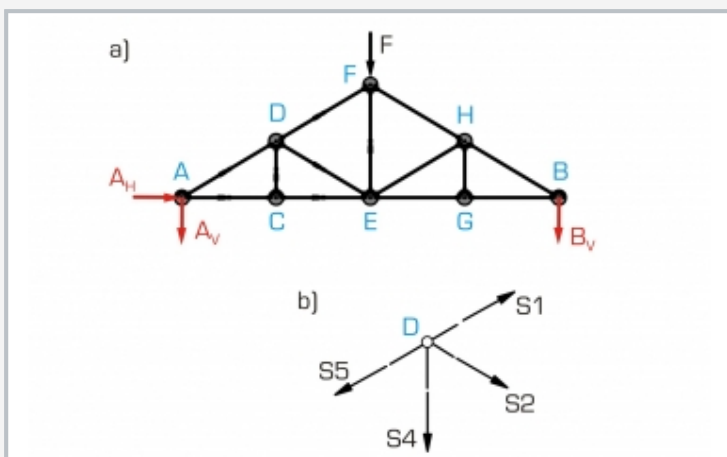Page 1/3 - 04.2018

SE 130
Forces in a Howe truss

1 load application device with force gauge, 2 node disk, 3 frame, 4 bar, 5 measuring point on bar, 6 knife-edge bearing, 7 adjuster screw
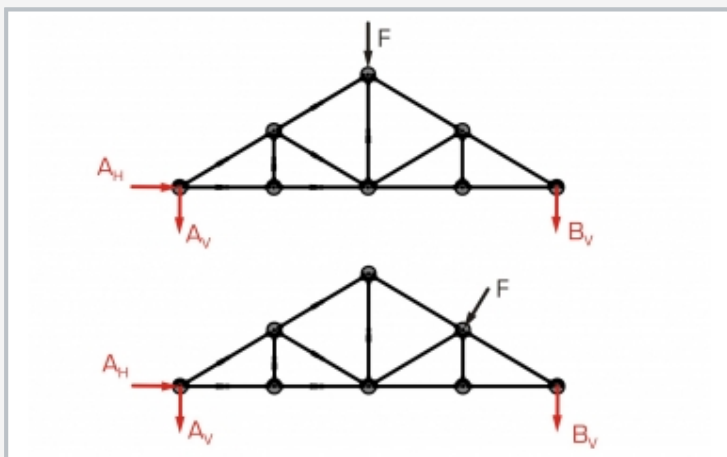
Load case, top: weight loading on ridge, load case, bottom: wind load perpendicular to roof; black: applied force, red: support reactions

Free-body diagram of a truss, nodal section method:
a) layout, black: applied force, red: support reactions, blue: node;
b) bar forces at node D

Specification

[1] investigation of bar forces in a single plane, statically determinate truss
[2] ready assembled Howe truss
[3] frame for horizontal experimental setup
[4] influence of dead weight minimized by horizontal experimental setup
[5] any straight and inclined load cases possible
[6] fine adjustment of load force
[7] low-friction knife-edge bearing
[8] 2 supports for vertical forces, 1 support for horizontal forces
[9] pre-balanced strain gauge connection box with connection to measuring amplifier FL 152
[10] measuring amplifier FL 152 required
[11] GUNT-software in FL 152 to evaluate measured values graphically

Technical data

Truss: Howe type
■ bar cross-section: 10x3mm, stainless steel
■ bar lengths: 115,5, 200, 231mm
■ external loading: max. 500N
■ bars: 13, of which 7 with measuring points

Load application device with force gauge
■ tensile force: max. 600N
■ stroke: 30mm

Node disks: 8
Angle between bars: 30°, 45°

LxWxH: 1220x620x250mm (frame)
LxWxH: 850x265x15mm (Howe truss)
Weight: approx. 43kg

Scope of delivery

1 frame
1 Howe truss
1 load application device
1 strain gauge connection box
1 ribbon cable
1 set of instructional material

Required accessories

021.15200	FL 152	Multi-channel measuring amplifier

Optional accessories

020.30009	WP 300.09	Laboratory trolley
022.13001	SE 130.01	Truss beam: Warren girder

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