SE 110.44
Deformation of trusses

The illustration shows SE 110.44 in a frame similar to SE 112.

Description

- **elastic deformation in a single plane truss**
- **construction of various truss**
- **application of Castigliano's first theorem**

When a component is placed under load it undergoes elastic deformation. This deformation can be calculated by determining elastic lines for example. Elastic lines describe the deformation of the complete component in the form of a mathematical equation. In reality, it is often only the deformation at specific points on the component which is of interest. Energy methods can be applied to determine these deformations more simply. Castigliano's first theorem uses energy methods to calculate the deformation of a point on the component. The theorem is applicable to both statically determinate and indeterminate systems.

In SE 110.44 the deformation of a single plane truss at one point is determined using Castigliano's first theorem. The truss under investigation is made of bars joined together by a articulated construction using node disks.

The trusses can be considered as ideal trusses. The bars have special snap-lock fixtures on their ends allowing them to be fixed easily into the node disks. A load application device attached to a node disk generates an external force.

The range of different bar lengths provided permits three forms of truss to be constructed. The bars are made of PVC, so their deformations are clearly visible.
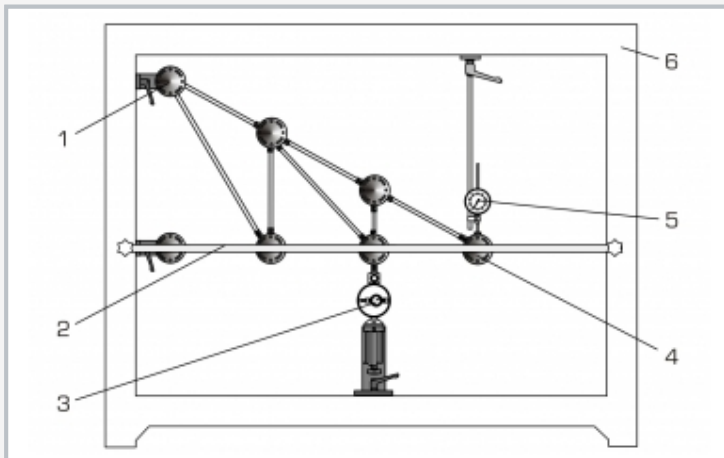
All the component elements of the experiment are clearly laid-out and housed securely in a storage system. The complete experimental setup is arranged in the frame SE 112.

## Learning objectives/experiments

- elastic deformation of truss under point load
- calculation of support reaction and bar forces
- principle of work and strain energy
- application of Castigliano's first theorem to calculate the deformation at a defined point
- verification of the calculated deformation possible by the principle of virtual work
- comparison of the deformations of different trusses under the same load
- comparison of measured and calculated deformation

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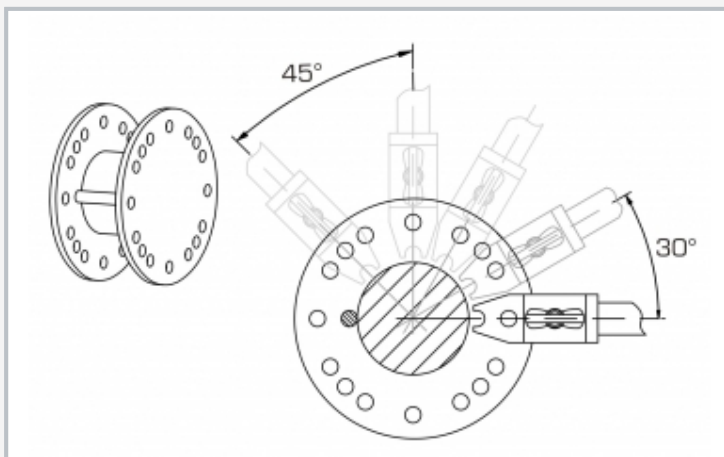Page 1/3 - 04.2017

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1 support with node disk, 2 cross arm for lateral stability of truss, 3 load application device with force gauge, 4 node disk, 5 dial gauge, 6 frame SE 112
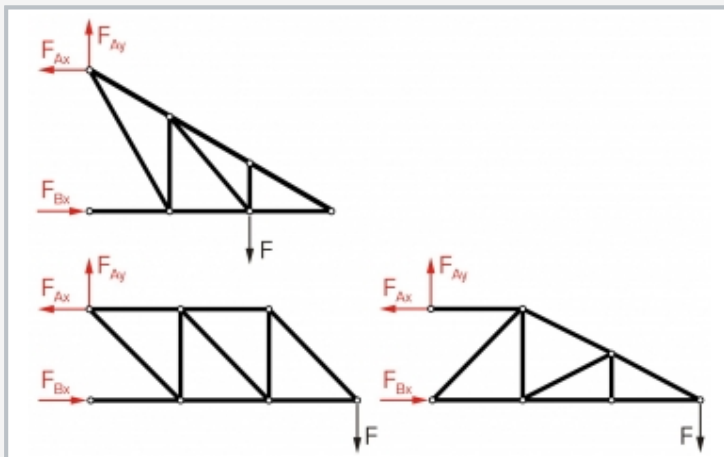
3 truss forms: red: support reactions, black: external force

Fixing of the bars in the node disk

Specification

[1] investigation of the deformation of statically de-terminate trusses
[2] construction of different truss forms possible
[3] 2 supports with node disks
[4] load application device with force gauge mountable on different node disks
[5] dial gauge to record the deformation of the truss under load
[6] cross arm for lateral stability of truss
[7] storage system to house the components
[8] experimental setup in frame SE 112

Technical data

Truss with 19 PVC bars
■ height of truss: max. 450mm
■ length of truss: max. 900mm
■ bar lengths: 2x 150mm, 5x 259mm, 7x 300mm, 1x 397mm, 3x 424mm, 1x 520mm
■ angle between bars: 30°, 45°, 60°, 90°
■ maximum bar force: 200N

Load application device
■ measuring range: ±500N
■ graduation: 10N

Dial gauge
■ measuring range: 0...0,10mm
■ graduation: 0,01mm

LxWxH: 1170x480x178mm (storage system)
Weight: approx. 26kg (total)

Scope of delivery

1   set of bars
5   node disks
2   supports with node disk
1   load application device
1   dial gauge with bracket
1   storage system with foam inlay
1   set of instructional material

Required accessories

022.11200	SE 112	Mounting frame