



Product Summary

- Portable, rigid structural frame with interchangeable test specimens
- I-beam, torsional tube & airfoil structures are instrumented with strategically placed axial and rosette strain gages
- National Instruments™ data acquisition system configured with LabVIEW™
- Pure bending, torsional, and combination forces adjustable with the integrated load cell system
- Extra bridge completion channels are included to facilitate open-ended student design projects
- Shipped assembled ready to operate

Students will learn: Practical and theoretical aspects of structural analysis. Test specimens include a strain gage equipped beam, tube, and an actual aircraft wing section.

Description

TrueStructures™ is delivered fully assembled as a portable and ready to operate structural analysis laboratory. Simple and complex bending, shear and torsion are demonstrated in a progressive fashion using an I-beam, torsion tube, and production aircraft airfoil structure. A durable powder coated main support frame is made from structural steel tubing and mounted on rolling casters for mobility. TrueStructures™ is sized to fit through any standard interior door, making it convenient for both laboratory and in-classroom use.

Test specimens are built of commercial-grade aluminum for long life. Industry standard linear and rosette foil strain gages are strategically mounted on all test specimens. A load cell equipped jackscrew mechanism allows the operator to apply an incremental force to each test specimen. Strain gage measurements feed a fully integrated and pre-calibrated National Instruments™ data acquisition system (full bridge completion). The system is configured with extra bridge completion channels, which allows custom placement of additional strain gages by student experimenters.

Strain gage measurement data is sent via USB connection to a LabVIEW™ generated virtual instrument (VI) panel on the provided laptop computer. This system displays real time data and has interactive operator control. Data can be recorded for future analysis. Software strain gage calibration allows users to load an offset value to each strain gage, and users can also automatically tare all strain gages to a zero point for easy on-screen graphing and analysis. The VI source code is provided for student experimentation/modification and supports teaching efforts in areas of modern instrumentation and data acquisition methods.

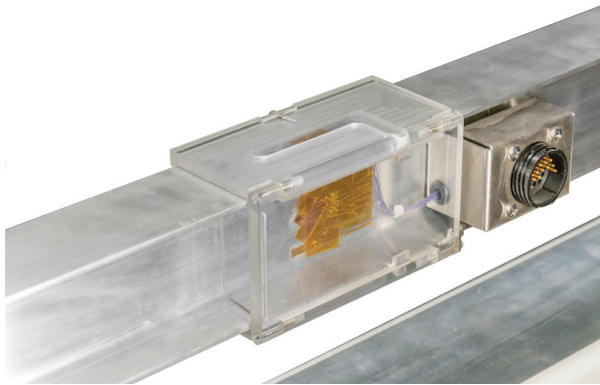
A multi-lesson laboratory procedure is provided to illustrate common usage of the TrueStructures™ lab. Solid models are also included to show the details of each test specimen, including the internal airfoil structure. These solid models and laboratory procedures are included on CD-ROM.



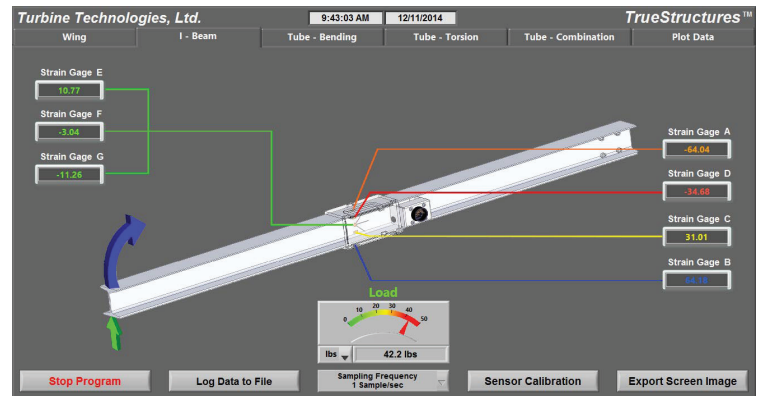
Data Acquisition Included

Experimental Opportunities

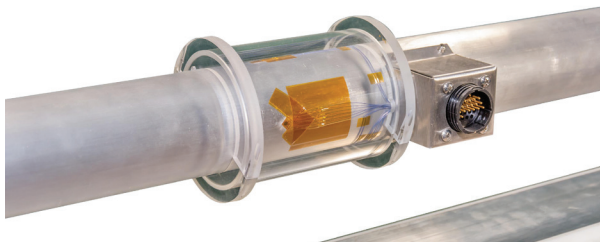
- Fundamental problems associated with statics and strength of materials.
- Basic structures concepts of bending, shear and torsion.
- Advanced problems with shear flow, combined loads and fittings.
- Material shapes, section properties and their effects on structural efficiency.
- Problems with loading, deflection and the stress & strain relationship.
- Usage of strain gauges and support equipment for experimental stress determination
- Aerospace, civil and mechanical structures analysis and testing.
- Design of experiments and data acquisition technique.



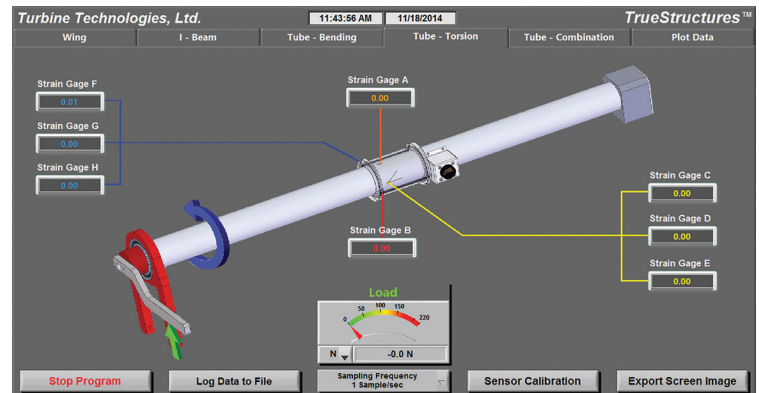
7 Strain Gages in I-Beam Structure



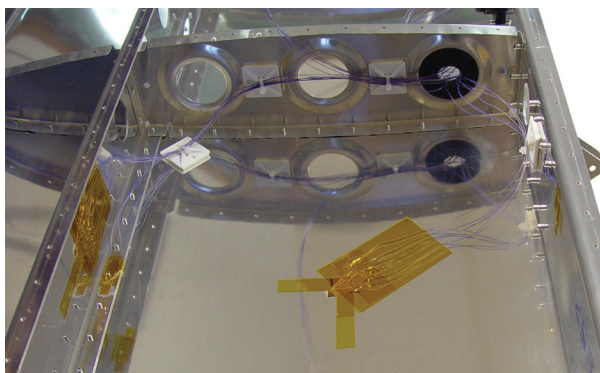
I-Beam Strain Test



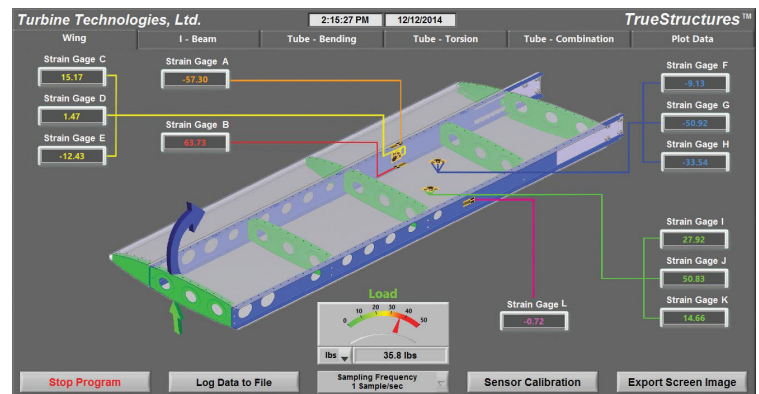
8 Strain Gages in Torsion Tube Structure



Torsion Tube Strain Test



12 Strain Gages in Airfoil Structure



Airfoil Strain Test

The TrueStructures™ test frame houses a mechanical jackscrew mechanism, which allows the operator to apply variable point loading to each test specimen. This could be pure bending, pure torsion or combination loading, depending on the specimen. A precision load cell mounted at the load point provides direct applied force readout. Multiple uni-axial and rosette strain gages are strategically mounted throughout each test specimen to measure the resulting strain values.



Jackscrew Mechanism

Details

Dimensions

TrueStructures™: 65L x 33W x 36H inches
(165L x 83W x 91H cm)
As Shipped: 79L x 36W x 49H inches
(200L x 91W x 124H cm)

Weight

TrueStructures™: 340 lbs (154 kg)
As Shipped: 435 lbs (196 kg)

Operating Requirements

Power: 120V/220V Auto Switching Supply
single-phase 50/60Hz

Instrumentation

Data Acquisition System:

- National Instruments™ Hardware
- 16 Strain Channels (4 open for expansion)
- 4 Analog Input Channels (qtr, half, & full bridge, 3 open for expansion)
- Windows Laptop Computer (all Software Loaded and Pre-calibrated)
- Single Cable USB to PC Connection
- Custom Virtual Instrument Display (Configurable Data Output)

Applied Load Indication:

- 0-100 lbs Button Type Load Cell (700 Ohm) Digital display of applied load in lbs or N
- Applied Load: 0-10V proportional to load cell output

Purchase Specifications

- A multi-use structures laboratory designed for engineering education.
- Utilizes interchangeable structural shapes that can be loaded in bending, torsion or combinations thereof.
- Aerospace test article to be of an actual air- craft-lifting surface
- Provided with multi-lesson laboratory proce- dures.
- To Include solid models of all test sections.
- Equipped with an infinitely variable, manually adjusted loading apparatus.
- Loading mechanism to be equipped with a fail safe over load device.
- Button type load cell installed at the point of load and connected to a digital display to indicate applied load/force in pounds or kilograms.
- Steel tape scale adjacent to the test article for the observation of deflection under load.
- All test articles to be instrumented with industry standard, foil-type strain gauges.
- Supplied with a 12-channel Strain Bridge Controller that powers the strain gauge circuit, is switch selectable between strain gauges and connected to a digital display to indicate selected strain gauge voltage.
- Designed with an “open architecture” that al- lows additional strain gauges on existing or user test articles.
- Frame to be manufactured from structural steel and finish powder coated as appropriate.
- Frame assembly equipped with lockable rolling castors.



TrueStructures™ has a free two year warranty on the entire system

© 2015

All TrueStructures™ specifications are subject to change