

ME 391: Measurements and Instrumentation Laboratory
Experiment Title: SM – Strain Measurement

1. Purpose

The student will learn the basic operating principles of strain gauges and the use of the Wheatstone bridge for accurate strain measurement. The experiment uses a cantilever beam (with gauges already attached) and the student will measure and calculate the axial and transverse strains as well as the deflection in the beam. Young's modulus and Poisson's ratio for the beam material will be calculated using experimental data. The student will also gain experience in collecting experimental data via a USB interface.

2. Learning Objectives

- a. Become familiar with the operation of resistive strain gauges.
- b. Understand the use of the Wheatstone bridge.
- c. Measure and calculate the surface strains and deflection of a cantilever beam, given the dimensions and material of the cantilever and the location of the strain gauges.
- d. Connect a strain gauge readout box for quarter-bridge and half-bridge configurations.
- e. Calculate Young's Modulus and Poisson's ratio from experimental data.
- f. Use an oscilloscope for dynamic strain measurements.
- g. Measure resonant frequency and compare to theoretical results.

3. References

Beckwith, *Mechanical Measurements*, 6th ed., Pearson/Prentice Hall, 2007
Student Manual for Strain Technology, Bulletin 309D, Vishay Measurement Group, Inc.

4. Equipment

Cantilever Beam Apparatus	Vishay P3 Strain Gauge Box	Caliper
Oscilloscope	Dial indicator	Flat beam (Alum. 6061-T6)
Set of weights	Ruler	BNC cable
Strain gauges attached to beam	Scale	USB cable
2 jumper wires for P3		

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Table of Contents Sm Experimental Method I M T B

1. Understanding the eBook Sm Experimental Method I M T B
 - The Rise of Digital Reading Sm Experimental Method I M T B
 - Advantages of eBooks Over Traditional Books
2. Identifying Sm Experimental Method I M T B
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Sm Experimental Method I M T B
 - User-Friendly Interface
4. Exploring eBook Recommendations from Sm Experimental Method I M T B
 - Personalized Recommendations
 - Sm Experimental Method I M T B User Reviews and Ratings
 - Sm Experimental Method I M T B and Bestseller Lists
5. Accessing Sm Experimental Method I M T B Free and Paid eBooks
 - Sm Experimental Method I M T B Public Domain eBooks
 - Sm Experimental Method I M T B eBook Subscription Services

- Sm Experimental Method I M T B Budget-Friendly Options
- 6. Navigating Sm Experimental Method I M T B eBook Formats
 - ePub, PDF, MOBI, and More
 - Sm Experimental Method I M T B Compatibility with Devices
 - Sm Experimental Method I M T B Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Sm Experimental Method I M T B
 - Highlighting and Note-Taking Sm Experimental Method I M T B
 - Interactive Elements Sm Experimental Method I M T B
- 8. Staying Engaged with Sm Experimental Method I M T B
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Sm Experimental Method I M T B
- 9. Balancing eBooks and Physical Books Sm Experimental Method I M T B
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Sm Experimental Method I M T B
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Sm Experimental Method I M T B
 - Setting Reading Goals Sm Experimental Method I M T B
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Sm Experimental Method I M T B
 - Fact-Checking eBook Content of Sm Experimental Method I M T B
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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