

(EXPERIMENT NO. 4)

CALIBRATION OF A PRESSURE GAGE USING DEAD-WEIGHT TESTER

1. Theory

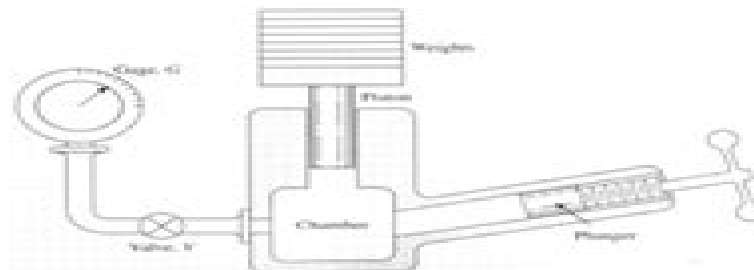


Figure 1. Deadweight Tester for Bourdon-tube pressure gage

A dead-weight tester is a device used for balancing a fluid pressure with a known weight. Typically, it is used for static calibration of pressure gages.

As seen in Figure 1, the apparatus is set up for calibration of the pressure gage G. The chamber and cylinder of the tester are filled with clean oil by first moving the plunger to its most forward position and then slowly withdrawing it while the oil is poured in through the opening for the piston. The gage to be tested is installed and piston pressure is now transmitted to the gage when the valve is opened. This pressure may be varied by adding weights to the piston or by using different piston-cylinder combinations of varying areas. The viscous friction between the piston and the cylinder in the axial direction may be substantially reduced by rotating the piston-weight assembly while the measurement is taken. As the pressure is increased, it may be necessary to advance the plunger to account for the compression of the oil and any entrapped gasses in the apertures.

The accuracies of dead-weight tester are limited due to: (1) the friction between the cylinder and the piston, (2) the uncertainty in the area of piston, (3) the buoyancy error and (4) gravity error.

The gravity error due to elevation, z [m], and latitude, ϕ [°] can be corrected by the dimensionless correction factor as:

$$e_{gravity} = -(2.637 \cdot 10^{-7} \cos(2\phi) + 2.9 \cdot 10^{-8} z + 5 \cdot 10^{-7}) \quad (1)$$

Metrology Lab Manual For Pressure Gauge

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Table of Contents Metrology Lab Manual For Pressure Gauge

1. Understanding the eBook Metrology Lab Manual For Pressure Gauge
 - The Rise of Digital Reading Metrology Lab Manual For Pressure Gauge
 - Advantages of eBooks Over Traditional Books
2. Identifying Metrology Lab Manual For Pressure Gauge
 - 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 Metrology Lab Manual For Pressure Gauge
 - User-Friendly Interface
4. Exploring eBook Recommendations from Metrology Lab Manual For Pressure Gauge
 - Personalized Recommendations
 - Metrology Lab Manual For Pressure Gauge User Reviews and Ratings
 - Metrology Lab Manual For Pressure Gauge and Bestseller Lists
5. Accessing Metrology Lab Manual For Pressure Gauge Free and Paid eBooks
 - Metrology Lab Manual For Pressure Gauge Public Domain eBooks
 - Metrology Lab Manual For Pressure Gauge eBook Subscription Services
 - Metrology Lab Manual For Pressure Gauge Budget-Friendly Options

6. Navigating Metrology Lab Manual For Pressure Gauge eBook Formats
 - ePub, PDF, MOBI, and More
 - Metrology Lab Manual For Pressure Gauge Compatibility with Devices
 - Metrology Lab Manual For Pressure Gauge Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Metrology Lab Manual For Pressure Gauge
 - Highlighting and Note-Taking Metrology Lab Manual For Pressure Gauge
 - Interactive Elements Metrology Lab Manual For Pressure Gauge
8. Staying Engaged with Metrology Lab Manual For Pressure Gauge
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Metrology Lab Manual For Pressure Gauge
9. Balancing eBooks and Physical Books Metrology Lab Manual For Pressure Gauge
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Metrology Lab Manual For Pressure Gauge
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Metrology Lab Manual For Pressure Gauge
 - Setting Reading Goals Metrology Lab Manual For Pressure Gauge
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Metrology Lab Manual For Pressure Gauge
 - Fact-Checking eBook Content of Metrology Lab Manual For Pressure Gauge
 - 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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