BACKGROUND

We will determine the torsional behavior of metal rods by torquing them in a simple torsion machine.

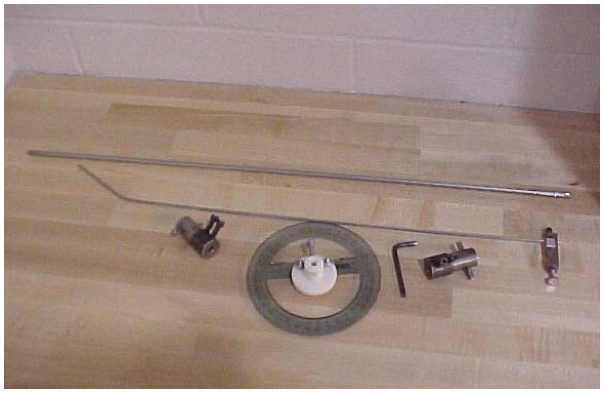
PRELAB

Find the value of the shear modulus G (and recall how to calculate it from the Young's modulus E and Poisson's ratio ν) of 7075 aluminum, steel, and yellow brass. Review your text and be prepared to determine the shear stress τ - shear strain γ curves from torque T - twist φ data.

EXPERIMENTAL PROCEDURE

A long cylindrical rod will be subjected to a torque applied by a hand crank. The twist of the rod will measured using a pointer and protractor. In order to determine the shear modulus, the stress and strain must be calculated from the data collected.

1. Acquire a specimen of material from the laboratory instructor.
2. Record specimen dimensions that will be required to reduce the experimental data. The data generated in this experiment will be torque and twist, and the stress-strain data must be determined.
3. Calibrate the load cell on the torsion machine using a torque wrench from 0 to -50 units and from 0 to 50 units on the dial gauge in 5 unit increments.
4. Configure the apparatus.
5. Place the protractor and pointer on the specimen.
6. Place the specimen in the torsion machine.
7. Apply a torque to the specimen using the hand crank.
8. Record the torque-twist data at regular intervals, e.g., every 5° of twist.



DATA ANALYSIS

1. Determine the shear modulus for each rod.
2. Identify each material tested.
3. Determine other appropriate properties from the stress-strain data (e.g., the proportional limits τ_{pl}).
4. Compare experimentally determined values to published values.