

## MEASUREMENT LABORATORY II

**Purpose:** to be familiar with surface roughness, hardness and coordinate measurements

### **Equipment and materials:**

1. Taylor Hobson Surtronic 3+ surface profilometer
2. Brown & Sharp coordinate measuring machine
3. Mitutoyo Rockwell hardness tester
4. Aluminum specimens (turned and milled) for surface roughness measurement
5. Parts for CMM
6. Steel and aluminum specimens for hardness testing

### **The items to be included in the report:**

1. Measured data and plots (roughness vs. feed)
2. AutoCAD drawings of the CMM results.
3. Straightness of surfaces A, B, C and D, out of roundness of holes E and F, parallelism. between A and B, and G and H, and perpendicularity between A and G (these have to be shown on the AutoCAD drawings).
4. Description on bearing area curve.
5. Hardness values in comparison with tensile strength data (available in handbooks)
6. Discussions and conclusions.

## [AME #1] Surface Roughness Measurement

### Procedure for surface roughness measurements:

1. Learn how to use the profilometer from the lab instructor.
2. Measure surface roughness of turned parts using cutoff lengths of 0.8 mm and 0.25 mm.
3. Rotate the part by  $90^{\circ}$  and repeat the measurement.
4. Generate  $R_a$ ,  $R_q$  and bearing area curve.
6. Repeat 2 through 4 with a milled piece at three different locations: at the center of tool path (perpendicular to lay, position A), at the mid-point (approximately 45 degree to lay, position B) and at the outer point (approximately 60 degrees to lay, position C). See Figure 1.

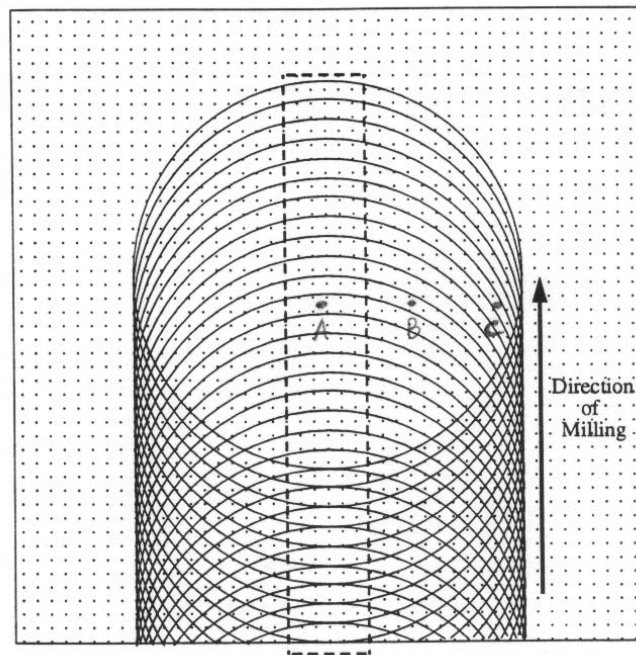


Figure 1 Measurement positions for the milled part.

## [AME #2] Hardness Measurement

### **Procedure for hardness measurements**

1. Learn how to use the hardness tester from the lab instructor.
2. Set the measurement scale to B for the aluminum, steel and stainless specimens.
3. After placing the specimen on the tester, ensure the minor load is set for the “R” scale.
4. Apply the major load of 100 kg for the aluminum specimen.
5. Record the hardness values.
6. Replace the indenter with the diamond indenter and set the scale to C
7. Repeat the measurements for the spring steel and pre-hardened specimens with the major load of 150 kg.
8. Record the hardness values.