



Purpose: To determine the surface roughness of a bowling ball.

Materials:

- Abralon pad of desired grit
- Ball cup
- Bowling ball to be tested
- Burette clamp
- Microfiber towel
- Isopropyl Alcohol
- Level work surface
- Right angle clamp
- Small level
- Storm Surface Factory
- Mitutoyo SJ-301 Surface Roughness Tester (Profilometer)
- Precision surface roughness specimen
- Triangular base stand
- Laboratory gloves
- Mitutoyo SJ-301 Surface Roughness Tester Quick-Reference manual
- Surface Roughness 15 Spot Template, Excel file

Note: Vibrations and non level work surfaces can cause errors in readings. Please take care to make sure that the work surface is level and there are no fans, motors or other vibrations around the work surface (bumping into the work surface, typing on a keyboard or telephone or opening and closing drawers can cause inaccurate readings).

Procedure:

1. Bowling Ball Preparation

- a. Place the Abralon pad on a sanding head of the Storm Surface Factory.
- b. Place the bowling ball inside the Surface Factory and close the lid.
- c. Select the “Sand” button on the user interface that corresponds to the sanding head chosen in Step 1.
 - “Sand 500” selects the sanding head in the back inside the Surface Factory.
 - “Sand 1000” selects the sanding head on the right inside the Surface Factory.
 - “Sand 2000” selects the sanding head in the front inside the Surface Factory.



- d. Select the sanding time by pushing the “+” button until the display on the user interface reads the desired time. USBC standard testing uses 3min 09sec.
 - e. Select “Enter”
 - f. Select “Start”
 - g. Don the laboratory gloves.
 - h. Allow the ball to go through the complete sanding and cleaning cycle.
 - i. Remove the bowling ball from the Surface Factory.
 - j. Using a clean microfiber towel, clean and dry the bowling ball.
 - k. Place the bowling ball in the ball cup on the work surface.
2. Assemble the Mitutoyo SJ-301 Surface Roughness Tester.
- a. Supply power to the display unit by connecting the AC adaptor to an electrical outlet and the display unit.
 - b. Connect the detector and the drive unit. Do not touch the stylus on the detector.
 - c. Connect the drive unit to the display unit via the cable provided.
 - d. Energize the profilometer by pushing the button labeled “POWER” located on the right end of the display unit.
 - e. Add the support foot to the end of the drive unit with the cord by sliding it upwards to so the blue line on the support foot is in line with the bottom of the drive unit.
3. Calibrate the profilometer.
- a. Obtain the precision roughness specimen.
 - b. Remove the cover from the precision roughness specimen and place it on the work surface so you can properly read the label.
 - c. Gently place the detector/drive unit on the indent in the precision roughness specimen so the detector is resting on the specimen.
 - d. Use the level to ensure the detector/drive unit is parallel to the work surface. If necessary, adjust the support foot to level out the detector/drive unit.
 - e. Touch the “CAL” button on the display unit touch screen.
 - f. Make sure the button in the center of the touch screen on the display unit reads the same measurement value that is on the precision roughness specimen. If not, push that button on the touch screen and enter the measurement on the specimen’s label.
 - g. Push the “Start/Stop” button on the display unit touch screen.
 - h. Allow the detector to read the specimen and return to its original position.
 - i. Accept the calibration by pushing the <enter> button on the touch screen only if the resulting measurement is within a 3% tolerance of the measurement on the



specimen label. If the measurement is out of tolerance, the detector and or the precision roughness specimen may need to be replaced due to wear.

4. Assemble the test stand.

- a. Attach the right angle clamp to the triangular based stand so the top of the clamp is approximately 10 inches high in reference to the work surface. The height of the right angle clamp might need to be adjusted based on the ball cup being used or the diameter of the bowling ball.
- b. Attach the burette clamp to the right angle clamp.
- c. Clamp the back end of the detector/drive unit into the burette clamp. Make sure the stylus on the detector is pointing downward.
- d. Level the detector/drive unit using the small level to be sure it is parallel to the work surface in both directions.

5. Data collection

- a. Open the Excel file “Surface Roughness 15 Spot Template”.
- b. Enter the bowling ball identification information in the appropriate fields in the template.
- c. Slowly move the bowling ball within the ball cup under the detector. The detector should be lightly touching the surface of the bowling ball approximately centered on the top of the bowling ball.
- d. Push the “Start/Stop” button on the display unit.
- e. Allow the detector to move across the bowling ball and return to its original position.
- f. Record the surface roughness measurements of Ra and RS shown on the display unit in the template.
- g. Slowly remove the bowling ball from under the detector/drive unit.
- h. Rotate the ball to a new evaluation area.
- i. Repeat steps d-h until 15 locations on the bowling ball have been measured. The 15 locations should cover the range of all the colors present in the bowling ball avoiding logos and markings so the overall surface roughness of the surface is obtained.
- j. The average Ra measurement, average RS measurement, Ra standard deviation and RS standard deviation, all in microinches are displayed on the template.
- k. Select File>Save As and Save the file on the network.