

Project 3.9 Testing Trueness and Squareness of Manufactured Box

1. Scope

1.1 This test method covers locations for measuring trueness and squareness of boxes manufactured for the Automata Mechanism in Introduction to Engineering Design.

1.2 This standard does not claim to address all safety concerns associated with its use. It is the responsibility of the tester to take appropriate precautions to protect the tester and the product from injury or damage.

2. Key Terms

2.1 squareness – the lack of deviation from a right angle.

2.2 trueness – the lack of deviation from straightness or flatness.

3. Measuring Apparatus

3.1 Straightedge, minimum length of 6 inches (or maximum dimension of the box being measured).

3.2 Rigid ruler, graduated to 1.0 mm or finer

3.3 Square, with sides at least as long as the longest side of the box

3.4 Flat surface, large enough to accommodate the box in its full width and depth dimensions

4. Test Specimen

4.1 The number of test specimens shall be determined by the number of specimens produced during a production run. Every box produced shall be tested.

5. Procedure

5.1 *Front Squareness*

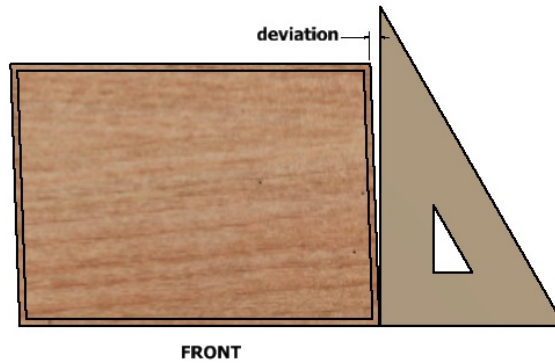


Figure 1

5.1.1 For front squareness, place the box on the flat surface such that the deviation from square is apparent with a line of sight to the front view as in Figure 1.

5.1.2 With the square resting on the flat surface, determine the deviation from square to the nearest 1.0 mm on the two sides at the point of maximum deviation. [That is, slide the square along each side until the maximum deviation is observed.]

5.2 Side Squareness

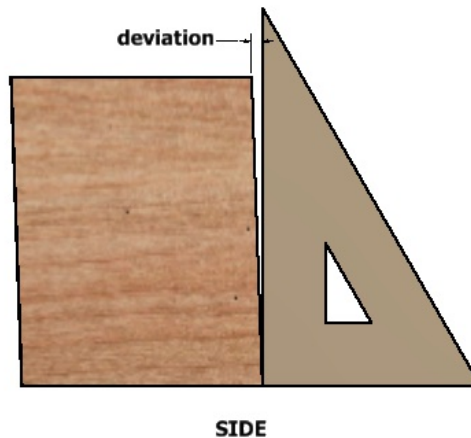


Figure 2

5.2.1 For side squareness, place the box on the flat surface such that the deviation from square is apparent with a line of sight to the side view as in Figure 2.

5.2.2 With the square resting on the flat surface, determine the deviation from square to the nearest 1.0 mm on the front face and the back face at the point of maximum deviation. [That is, slide the square along each side until the maximum deviation is observed.]

5.3 Top Squareness

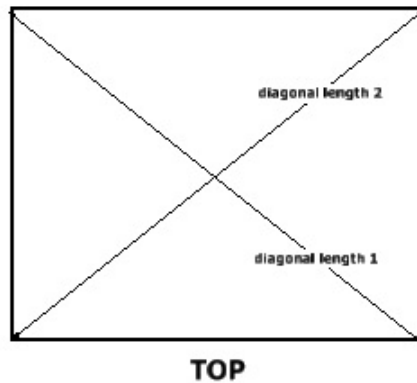


Figure 3

5.3.1 For top squareness, place the box on the flat surface and measure the diagonal lengths (as shown in Figure 3) to the nearest 1.0 mm.

5.3.2 The top squareness is the difference between the lengths of the diagonals.

5.4 Bottom Face Trueness

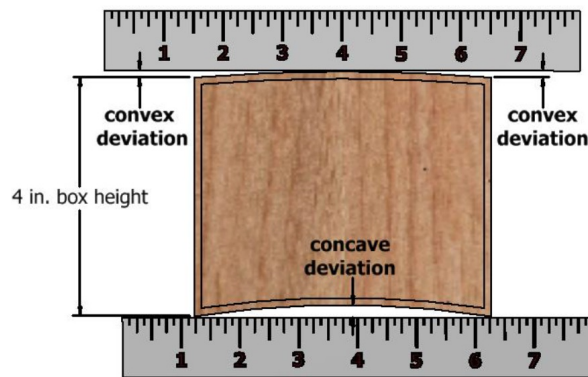


Figure 4

5.4.1 For bottom face trueness, place the box on the flat surface with the back face down as in Figure 4.

5.4.2 With the straightedge next to the **bottom** of the box on the flat surface, determine the concave deviation from true at the point of maximum deviation (see Figure 4).

5.4.3 For convex deviation from true, measure the deviation by equalizing the distance between the straightedge and the box at both corners of the box (see Figure 4).

6. Report

6.1 Report the following information:

- 6.1.1 Nominal dimensions of box
- 6.1.2 Manufacturer and date of manufacture
- 6.1.3 Date of testing

6.2 *Squareness:*

- 6.2.1 Maximum deviation from front squareness in millimeters
- 6.2.2 Maximum deviation from side squareness in millimeters
- 6.2.3 Maximum deviation from top squareness in millimeters

6.3 *Trueness:*

- 6.2.4 Maximum deviation from **bottom face** flatness in millimeters